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TECHNICAL ADVANCE IN COMMUNIST CHINA'S LIGHT INDUSTRY

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TECHNICAL ADVANCE IN COMMUNIST CHINA'S LIGHT INDUSTRY

[The following are translations and extracts of selected articles from Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Numbers 14, 15, and 17, 1958.]

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HOW TO PROMOTE THE LEAP FORWARD IN LIGHT INDUSTRY UNDER THE NEW SITUATION

[The following is a full translation of a speech by LI Chu-ch'en, Minister of Light Industry, to the National Conference of Directors of Departments and Bureaus of the Ministry of Light Industry. The speech was published in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 14, 28 July 1958, pages 2-4.]

I. The great leap forward situation in light industry in China during the first half of 1958

Four months have elapsed since the All-China Light Industry Conference was held in Peiping in February and March of 1958. Because the Party's general line on Socialist construction penetrated into the people's mind and because this correct line stimulated the "heaven-reaching" effort of 600 million people, the nation's appearance has been altered in a short period of time.

From last winter to this moment, irrigation has been extended to about 400 million mou of land in all China, and 160 million mou of land were planted with early-crop rice, which represents an increase of 40 million mou over the 1957 figure. Grain harvested this summer showed an increase in production volume by 35 billion chin compared with the figure for 1957, and rapeseed crops were generally bountiful.

High-production experimental fields continuously came into existence. At Hsi-p'ing Hsien, Honan Province, the per mou yield for wheat hit the 7,320 chin mark while at Min-chi Hsiang of Ma-ch'eng Hsien, Hupeh Province, the per mou yield for rapeseed reached 1,146 chin. Experimental farms for spring-sown crops strove for a yield of 3,000 chin of grain per mou, 1,000 chin of unginned cotton per mou, 200,000 chin of sweet potatoe per mou, 130,000 chin of sugar cane per mou, etc.

From this it can be seen that 500 million farmers under the Party's leadership have turned from a small farm economy to a cooperative system. After the all-people

rectification and liberation of thought, a spirit of "dare to talk, think and act", a "heaven-reaching" revolutionary effort and a great Communist spirit developed!

Many demands on industry emerged from the great leap forward in agriculture, which called upon industry to provide fertilizer, pumping and irrigation machinery, farm tools, power generating equipment, transport facilities and equipment for processing farm produce.

At the same time, the development of industry was accelerated. Industrial production for the first five months in 1958 either doubled or increased by one half or by one-third compared with the corresponding period in 1957. The figure for industrial output in May increased by 46 percent as against the corresponding figure for 1957; investment in capital construction rose 54 percent. Of the several million units of the nation's local-operated industry that had been thrown into production, over 20,000 were operated at the hsien level and above.

During the first half of 1958 achievement in light industry was considerable. With the exception of a small amount of domestically-used shoes, leather goods, fruit wine and enamelware that had become unmarkable due to poor planning, the demand for other products was, in general, greater than supply.

To cite an instance, 700,000 tons of crude salt were consumed in Kwangtung Province to supplement and complement fertilizers. Enamelware, glassware and pottery for the chemical industry, rubber footwear for rural consumption, cultural and industrial paper, fats and oils, low-grade cigarettes and metals were under-supplied.

The actual volume of production from January to May 1958 as compared with the corresponding period of 1957 showed a rise of 30 percent in rubber footwear, 28 percent in paper and paper board, 26 percent in sugar, 14 percent in crude salt, 13 percent in cigarettes and 5 percent in edible vegetable oil.

It was first estimated that the production of paper, paper board, rubber shoes, bicycles, sewing machine, heavy hide, light hide, leather shoes, matches, enamel basins, tumblers, thermo-flakes, fountain pens, pens, pencils, canned goods, edible vegetable oil, sugar, wine and liquor alcohol, crude salt, cigarettes and soap--in all 22 kinds of products--would exceed the goal set for 1958.

The handicraft industry played an important role in the development of local industry. In stepping up the development of small-scale industry in hsien lacking

industrial foundations, handicrafts formed a basis on which hsien industry was to be developed, and supported, in no small measure, the agricultural technological revolution.

During the first half of 1958 metal processing, iron and steel, and timber cooperatives, among other handicraft industries, mustered great effort in expanding their operations and in promoting the technological revolution. Blast furnaces were built by many smelting cooperatives operating with their own mines, blast furnace equipment and native technical experts. It was estimated that over 20,000 lathes and 180,000 units of power equipment could be produced in 1958.

By exerting a "heaven-reaching" effort, the gross value of production in industrial arts (kung-i mei-shu) would, according to a preliminary estimate, reach a value of more than 600,000,000 yuan in 1958.

The employees and workers and the broad masses have already raised the technological revolution to a great height. By creating a continuous pulp thrashing method, the paper making industry increased its rate of efficiency by 30 percent. Automatic clay kneading, casting and glazing machines were adopted by the pottery industry while a mill in Shantung Province increased its rate of efficiency 6-7 times by renovating grindstones. Shoe soles were sewn on by machine. Ricestalks were utilized for making wine, feedstuff, paper and fertilizer. Apart from its use for oil extraction, bran could be used for the preparation of bran paraffin, wine, sugar and feedstuff. "Ma-wei-sung" [a variety of pine], bagasse [residue of extracted sugar cane], "hsiao-yeh-chang" [small-leaf camphor tree] and reeds were used one after another for the manufacture of artificial silk. Paper cement bags were manufactured from a mixture containing 50 percent bagasse. Other innovations included fiber glass steel, crystal glass, unbreakable enamel, pottery gas furnaces, blast machines, bamboo and wooden centrifugal machines, wooden paper making machines and others. These served as proof that by eradicating superstitions and by glorifying the spirit to think and act without fear, employees and workers could increase productivity, utilize resources to thiir fullest and work innumerable miracles in the manufacture of new products.

During the first half of 1958 many products equaled or even surpassed the advanced world level in quality: balium chloride of the Tzu-kung Salt Company excelled the British-made; marine chart paper, high-grade drawing

paper and high-grade watercolor paper of the Shantung Paper Mill equaled British products. The cellophane paper of the Chekiang Min-feng Paper Mill also equaled West Germany's and Austria's in quality. Other lines, such as the 01 model fountain pen, Ying-hsiung [Hero] pen, Pei-ching [Peking] brand, Hung-yen brand and T'o-niao [Ostrich] brand ink, Ch'ang-chiang brand hand organ of Chungking, etc., either equaled or surpassed the advanced level of the world.

In short, our accomplishment during the first half of 1958 was indeed immense. In the wake of this initial success would follow the setting of continual higher records. This achievement was made possible mainly through the correct leadership of the Party and the execution of the Party line, and through reliance on and mobilization of the masses. Illuminated by the Party's general line, the unlimited strength of the masses was alerted. We should continue to forge ahead in the illuminated path of the Party's general line!

II. How to Expedite the Great Leap Forward in Light Industry Under the New Situation

Light industry plays an important role in the national economy. It is responsible not only for satisfying the needs of the people's livelihood, but also for the accumulation of capital for the State, and the acquisition of foreign exchange to support agriculture, heavy industry and cultural, educational and scientific undertakings.

In view of this, Chairman Mao in his report on "Ten Great Relations" demanded that the Party understand fully the relationship between industry and agriculture and between light industry and heavy industry. The technological foundation for the development of light industry should rest on heavy industry. The rural village should be made a base for obtaining raw materials and for marketing finished products. Without heavy industry and a strong agricultural foundation, it would be difficult to develop light industry.

Under the new situation brought about by the great leap forward in agriculture, over-all tension was manifested in iron and steel production and equipment manufacture. The importance of according priority to the development of heavy industry was more deeply appreciated by us.

In announcing "steel as a principle" for the promotion of all activities, the Central Committee directed that, within a period of two or three years, we should concentrate our energy on the development of heavy industry with the production of foodstuff, iron and steel and machinery and the development of electric power and railway as "vanguards". We completely endorsed this principle. In the national economy as a whole, (light industry included), material conditions should be fulfilled in preparation for technological reconstruction.

For light industry not to leap forward under the new situation, would mean a dislocation in the entire national economy obstructing the leap forward in related economic departments.

Why should light industry leap forward under the new situation?

(1) An agricultural leap forward would, of necessity, demand growth of the farm product processing industry. A bumper crop in rapeseed caused the gross volume of production as preliminarily estimated in 1957 to rise from over 18 million tan [picul] to 28 million tan, representing an increase of about 10 million tan; the area for planting cotton increased from over 86 million mou of land as preliminarily estimated in 1957 to more than 90 million mou of land in 1958, thereby increasing the gross volume of cottonseed production by 14 percent. The tuber crop also expanded as the result of an area increase from 157 million mou of land, as preliminarily estimated in 1957, to more than 220 million mou of land in 1958. The gross volume of tuber production might jump from more than 400 million tan to more than 700 million tan--an increase of about 300 million tan.

The production of sugar cane and sugar beets were respectively stepped up from over 200 million tan and over 30 million tan, as preliminarily estimated in 1957, to 380 million and 85 million tan as estimated in 1958.

Even the production of leaf tobacco, in which a shortage occurred this year [1958], showed an increase from 6 million tan as preliminarily estimated in 1957 to 10 million tan in 1958.

The above conditions clearly indicate that unless the farm produce processing industry and handicraft industry catch up with general progress, the active interest of the farmers would be impaired.

(2) Light industrial supplies are of assistance to any great leap forward development in heavy industry. Crude salt and its by-products should be developed proportionately with the chemical industry. The manufacture of various industrial papers including condenser paper, high and low-tension cable paper, mica ribbon paper, insulating paper board, asbestos paper board, aeronautical structural plate steel paper, etc., should be properly developed.

To support the growth of the chemical industry, enamel reaction crucibles, solution storage containers, mixing vessels, etc., should be manufactured. The production of all types of erosion resistant and high-temperature resistant vessels, jars and containers, pipes, acid resistant pumps and blast machines by the pottery industry, the manufacture of various kinds of industrial glass containers, measuring instruments and optical apparatuses by the glass industry, the production of various types of industrial leather belting and leather parts by the leather industry, the distilling of alcohol and its by-products by the distilling industry and the manufacture of industrial plastic products by the plastic industry--these aspects of ligh industry are indispensable to the development of heavy industry.

In some cases, even steel materials cannot be used as substitutes. We should therefore adequately satisfy the needs of the industrial departments concerned by assisting in their development. It was incorrect to consider devotion to the manufacture of light industrial goods as "off the track". It was also incorrect to desist from active engagement in the development of light industry when conditions and needs warranted it.

(3) Following expansion in production and an increase in employment, people's purchasing power will rise relatively while their cultural life and living standard rise continuously. Light industry must satisfy newly-created needs.

(4) Light industry products form an important part of export trade. If export figures for light industry products in 1957 were 8.7 percent of the nation's gross export value, then the figure for 1958 would jump to 16-18 percent. According to a preliminary estimate, the figure for 1959 will reach 20-22 percent of the planned gross export value figure for 1959.

If we persevere in raising the quality of production, in diversifying production, in lowering production cost and in improving packing, it is perfectly possible

to broaden the market. Light industry products will play an increasingly important role in export trade. To meet this demand from abroad, we should strive to improve our light industry so as to obtain more foreign exchange in line with the nation's export trade activity.

It can be seen from the above analysis that the development of light industry should be proportionate to the growth of the entire national economy. This is an objective growth pattern seen in socialist economy. But, hampered by the present shortage in equipment, what attitude should comrades engaged in light industry work assume? I am of the opinion that the leap forward--the great leap forward--be continued without any delay. How should this be done? Based on the rich experiences recently acquired by the various districts involved, the following measures should be included:

(1) We should mobilize the masses without any restriction, eradicate superstitions and think and act without fear. More small-scale plants--principally medium and small-size ones--should be established. In principle, we should adopt the native method, follow it by the foreign method and eventually combined it with the foreign method. We should let small-scale plants grow up on their own strength.

During the first half of 1958, several million plants, mostly small ones operated by hsiang cooperatives, were set up and developed rapidly. This was done without seeking aid from the State for capital investment, equipment, steel materials and technical experts. By the same token, large-scale plants lagged behind in operation and looked to the State for aid in capital investment and equipment.

Since millions of small-size plants of the light industry category could leap forward without steel materials, why was it thought impossible for the light industry to leap forward? In the eyes of many people, the native method was a synonym for backwardness.

Deputy Premier Po rightly said: "Low may be changed to high, 'native' may be changed to 'foreign'. Between the so-called 'low standards' and 'native methods' are often embodied many of our people's technically superior traditions--their creations and inventions. These 'low standards' and 'native methods' are easily adopted across the country and readily improved. Today they are termed

'low standards' and 'native methods'; tomorrow they are changed into 'high standards' and 'foreign methods' after some improvement. Handicapped by a lack of new equipment, but working with their bare hands and brilliant minds, our workers and technical personnel successfully tested the production of thousands of new products during the first five months of 1958. What more impressive evidence can we have than their adoption of hundreds of new production techniques?"

To mobilize masses with full confidence and to rely on them is, therefore, a road to the leap forward in light industry.

(2) By relying on the masses, many kinds of non-ferrous equipment have been invented. Because of a bumper crop in 1958, the processing of sugar beets loomed as a problem to the great discomfort of the producers in various districts. The problem was resolved by the masses. The method was to convert sugar beets into dried shreds to prevent their sugar content from decomposing. Also, a centrifugal machine made of bamboo, wood or pottery was invented. Thus, the situation is now under control.

It was also possible to manufacture paper making machinery without using a large quantity of iron and steel. For example, steaming and boiling equipment was built with a large vessel as the base. This was walled up with cement and covered with an iron lid. This makeshift device was almost as efficient as the ball boiler. It was suggested that artificial fermentation be substituted for pulp boiling, that wood be used for the manufacture of paper making frames and, that porcelain tanks be substituted for drying vessels--a great revolution in research work. In Peiping, 80 percent of the equipment of a paper mill was made of wood. In Shang-ch'iu, a paper mill was basically operated with wooden equipment with a daily production capacity for two tons of paper. The investment, it was estimated, would amount to only 20,000 yuan.

How could the problem of an alcohol distilling tower be solved? In Peiping it was replaced by a jar, and the problem was resolved. Also, all types of acid resistant pottery apparatus such as pottery blast machines, centrifugal pumps, double-axle ball mill machines, turbine pumps, gas furnaces, acid resistant towers, plate and boards, etc., were manufactured by I-hsing producers as substitutes for steel materials. These experiences should all be utilized and promoted.

In short, the wisdom of the masses is unlimited. So long as we mobilize and depend on the masses, and so long as we indulge in technological revolution, obstacles will certainly be surmounted!

(3) We should smelt iron and steel with our own hands and manufacture all kinds of light industrial equipment ourselves. Qualified light industrial plants have already smelted iron and steel themselves, utilizing machine repair workshops to produce light industrial equipment. All this will be helpful to the accumulation of equipment.

(4) To economize greatly the consumption of steel materials, all iron and steel frameworks, piping, containers, steaming and boiling vats and structural materials should be replaced whenever possible. Where difficulties arise, the production procedure should be simplified by combining native and foreign methods, by utilizing used materials, by substituting lower grade material for higher grade, by making inventories of the warehouses and by adopting a unified system of adjustment.

There were serious indications of waste in the steel materials used for building up the light industry. One ton of steel was known to have been employed for manufacturing paper making equipment with a production capacity for two tons of paper. At the same time, 36 tons of steel were used for making the same equipment with a daily capacity for only one ton of paper. Either it is unnecessary for some factory buildings to be built of reinforced concrete, or less reinforced concrete should be used.

The attention of the scientific and engineering technical personnel and the entire corps of employees and workers should be drawn to the problem of economy in steel materials consumption. This should be made an important policy theme for technical research by all concerned with light industry. We should do away with superstitions and be fearlessly creative. Every chin of the nation's steel material and every item of valuable equipment should be saved.

By the spirit indicated above, our task in developing light industry is: to stimulate effort and see it through; to strive for the upper reaches; and to build up Socialism's general line with speed, skill and economy and with emphasis on the following points:

First, we should grasp directives, policies and ideology, politically speaking.

Second, we should mobilize and rely on the masses.

Third, more small-scale plants should be built with emphasis on medium and small-size factories.

Fourth, the technological revolution should be promoted.

Fifth, we should greatly strengthen our scientific research work and create non-ferrous equipment.

We should be guided by these basic attitudes and methods in bringing about the great leap forward in light industry under the new situation.

PORCELAIN EXHIBITS MAGIC ABILITY TO SUBSTITUTE FOR STEEL

[The following is a full translation of an article written by Kao Kung-i, in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 14, 28 July 1958, page 5.]

Successful trial production of gas furnaces at Ting-shu-chen, I-hsiang: In the course of the great leap forward in production, the labor force of the I-hsiang ceramics industry has done a big job for the farm compatriots. By successfully trial-producing ceramic gas furnaces, a favorable condition has been developed toward the mechanization of irrigation for agricultural purposes.

A gas furnace, 143 centimeters in height and 65 centimeters in internal diameter, was trial-manufactured in the middle of May by the Wu-hsi Diesel Engine Works. The development of horsepower was stabilized at 28 to 30. Speed in ignition and economy in coal consumption were noted. Production costs dropped by 90 percent while working efficiency was maintained at a level with gas furnaces made of iron and steel. For each unit that comes off the production line, a saving of over 1,000 chin of iron and steel is made.

Back in early April, Yao Tao-hsin, an engineer of the Local-State Jointly-Operated Wu-hsi Diesel Works, proceeded to the Ting-shu-chen laboratory workshop to examine the possibility of substituting ceramic for iron and steel in the production of gas furnaces.

Technician Chiang K'ai-t'ung, after consulting with an experienced foreman, his master, Ho O-ch'u, regarded trial production as feasible. He proposed that a No 2 air container (a substandard item) be utilized for the remodeling test. No cracking occurred when water was passed through it for four hours although cracks were observed at its base because of a sudden change in air temperature. The result of this laboratory test was studied by the entire corps of employees and workers.

Breakage from an abrupt change in temperature was avoided by increasing the heat conduction of the furnace and by reducing its extent of contraction. In preparing the slip, more clay of coarser grains was blended. Furthermore, the interior of the furnace was lined with light-

weight heat-insulating bricks, and the screeners and filters were to be made of fire resistant clay. A complete set of ceramic gas furnaces was thus ready for shipment. The first batch of 5 units has already been dispatched to the municipality of Wu-hsi for display at the Industrial Communications Exhibition.

The composition and the technical procedure are given below:

A. Composition:

I-hsing white clay 30 % (containing 70% silicon dioxide--SiO^2 and 22% aluminum oxide--Al_2O_3).

I-hsing "pen-chia" clay 20% (containing 60% silicon dioxide--SiO_2 and 25% aluminum oxide--Al_2O_3).

I-hsing "tung-chia" clay 30% (containing 63% silicon dioxide--SiO_2 and 28% aluminum oxide-Al_2O_3).

I-hsing "chien-chia" clay 20 % (containing 63% silicon dioxide--SiO_2 and 25% aluminum oxide-Al_2O_3).

These four types of clay are blended pro rata and are passed through a 12-mesh sieve after grinding. The grains are fairly coarse.

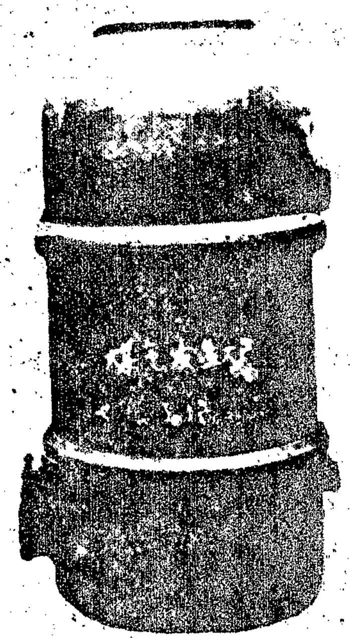
B. Technical Procedure:

1. It takes 12 hours to turn the potter's clay into slip after grinding.
2. Three operatives are engaged in casting simultaneously. Molding is done at upper, middle and lower sections, and 30 hours are required for its completion.
3. After casting, the biscuit first dries in the shade; it is then dried in the sun or baked in an oven until it is completely dry. The process takes 72-100 hours to complete.
4. Firing--The biscuit is fired in a sealed chamber at a temperature rising from 100°C to

1250°C. The firing cycle is completed at a 40-hour interval; it is kept for 2-3 hours at maximum temperature.

5. Cooling off--the fired batch is removed after 10-16 hours. Premature opening of the oven may cause the fired article to crack as it is brought suddenly into contact with cold air.

With the manufacture of ceramic gas furnaces, the substitution of ceramics for iron and steel as a production factor is bound to broaden immensely. [The following is a photograph of the ceramic gas furnace.]



Ceramic Gas Furnace

THE PORCELAIN INDUSTRY SERVES THE STEEL INDUSTRY

[The following is a translation of an article written by Lei Shih, Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 14, 28 July 1958, pages 5-7.]

Successful Trial Production of Silicon Carbide High-Temperature Protective Sleeve

The silicon carbide high-temperature protective sleeve, known in the trade as a "carborundum tube", is an important instrument for measuring steel in liquid form during reduction. It forms an indispensable part of the thermo electric-couple thermometer. Ordinarily, the temperature rises above 1400°C, for the measurement of which a precious metal-like platinum must be employed. Moreover, the thermo electric pole must be made of an alloy of platinum and rhodium.

As platinum or platinum-rhodium alloy thermo electric poles are liable to be damaged under the reducing vapors of phosphorus, arsenic and silicon, the heat contacting point of the thermo electric pole is insulated by a specially fire resistant protective sleeve. This instrument must possess a high degree of resistance to abrupt changes in temperature and firing. Ordinarily, expensive imported quartz fire resistant glass tubes are used. Much waste is incurred as the tubes must be changed after each measurement.

A sample product of silicon carbide high-temperature protective sleeve was turned out by the laboratory after the instrument had been studied by the fire resistant material section of the iron and steel research institute of the Ministry of Metallurgical Industry with a view to establishing its properties as a low-priced substitute.

While silicon carbide protective sleeves can be used as substitutes for imported quartz glass tubes, its official production was delayed two years because of strict technological controls and complicated technical production procedures. We had to depend upon imports to meet the needs of the metallurgical industry for vast quantities of thermo electric-couple high-temperature protective tubes. A great deal of foreign exchange was thus annually wasted.

Trial Production

Returning from practice at the Central Experimental Laboratory of the Anshan Iron and Steel Company, Huang Nai-t'ing, a technician at Kung-chu-ch'eng Pottery Works, T'ang-shan-shih, brought back testing materials related to the production of silicon carbide high-temperature protective sleeves. Following study at the works, this device was considered necessary for the iron and steel industry. On completing trial production, it would not only count toward saving foreign exchange, but also play a decisive role in supporting the great leap forward in the iron and steel industry. It was thus decided that the device be trial-produced.

The Kung-chu-ch'eng Pottery Plant developed during Socialist transformation from an amalgamated group of private-operated factories. Simple in equipment and weak in technical capacity, it met with many difficulties in the course of trial production. But by relying on the collective wisdom of the masses, by making technical personnel collaborate with the labor force, and by repeatedly improving operational procedures, a small-size coal-fired kiln, capable of developing a temperature of 1600°C, was added to the equipment. The plant originally operated a "man-t'ou" [or dome-shaped] kiln capable of about 1400°C. Trial production began on 25 May and the first samples was ready by 12 June. After a preliminary inspection, they were found up to standard. The achievement came about in a trial production period of less than 20 days.

Simple Technical Procedure

1. The composition of ingredients: Chiefly synthetic carborundum No 120 containing principally silicon carbide (SiC) and small amounts of such foreign matter as iron oxide and aluminum oxide (Al_2O_3) of high purity for industrial uses. These are compounded in fixed proportion before they are ready for crushing.

2. Treatment of raw materials: The mixture is poured into a ball-shaped grinding machine, to which a fixed amount of pure water is added. It is ground for 60 hours before the hard-paste is emptied into a gypsum

trough where the moisture is removed. The sediment is shovelled into a procelain vessel. To the mixture is added diluted hydrochloric acid (Hcl) of fixed density to assist in sedimentation; it is evenly agitated until the coarse grains float to the top. The slip or paste is ready for casting as its viscosity increases.

3. Casting procedure: The paste should be agitated rapidly before it is poured into the mold. Pouring should be done with speed to prevent the formation of sedimented layers. Any unevenness in paste density results in a lack of consistency in the finished product. The biscuit should be removed before it is completely dried out. It is stacked ready for firing after a little conditioning and drying.

4. Stacking and firing: Dried and conditioned biscuits when found free from defects after inspection are stacked on the rack. To protect its contents from direct contact with the air, the container is buried completely in the soot. It is placed in the kiln for firing at 1540-1550°C on trial production. The finished product is ready if it is free from such defects as burning, distortion, cracking, etc.

Notes:

1. Being extremely hard, man-made carborundum is difficult to grind in an ordinary ball mill. Fineness may be obtained by increasing the number of grinding balls and by lowering the speed of grinding revolutions during trial production. If the ball mill were lined with high-hardness steel plate and if steel-type porcelain balls were employed in processing, the efficiency of grinding would certainly be heightened.

2. Because carborundum is higher than aluminum oxide in density, the hard-paste is liable to be marked by a stratified sedimentation. This not only causes inconsistency in the body, but also upsets the proportion of its composition. Substandard goods are produced as a consequence. The slip must be sufficiently agitated before being poured into the mold to acquire proper concentration. Speed in operation is also essential in assuring quality in production.

3. Diluted hydrochloric acid functions as a dispersing agent when the slip is poured into the gypsum mold which is prone to chemical reaction. In trial production, the biscuit is taken from the mold the moment the required strength is obtained. This is done before drying is completed. The gypsum mold is dried instantly to permit the evaporation of any remaining hydrochloric acid. To overcome this difficulty, a steel mold may be used instead and casting may be performed while the slip is in a semi-dry state.

4. Carborundum products should not be fired in oxygen-loaded gas furnaces because silicon carbide becomes oxidated and decomposed at 1000°C. This oxidation and decomposition will continue until a maximum temperature of 1700°C is reached. To divorce oxidation and decomposition from silicon carbide during firing, the firing box containing the biscuits should be covered with soot to achieve isolation from the flame during trial production. Charcoal, coke, graphite and quartz sand may also serve as covering materials.

5. It was observed that, due principally to insufficient firing, the trial production did not measure up to standard strength. A better showing would result if the firing temperature were increased and if casting were done while the slip was in a semi-dry state. All this will be considered in future trial production.

Economic Value

Judging from the results of trial production at the Kung-chu-ch'eng Pottery Works, the requirements of a joint iron and steel enterprise operating four units of "saddle steel" machine can be met by four workers participating in production. According to a preliminary estimate, an annual saving of 2,440,000 yuan in foreign exchange could be made--a sum sufficient for buying back 5,800 tons of steel materials or for the erection of a pottery factory with an annual production capacity for 4,000 tons.

At a time when our iron and steel industry is making a great leap forward and when newly constructed mills "are blooming across the country" under this new situation, the successful trial production of silicon carbide high-temperature protective sleeves for servicing the iron and steel industry is undoubtedly a highly significant event.

GRAPHITE CRUCIBLES

[This is a translation of an article written by Kao-kung-i and Ch'ien Chih-ch'ao, in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 14, 28 July 1958, pages 6-7.]

Pao Lung-sheng and Pao Fu-sheng, biscuit makers at I-hsing Jih-yung [Daily Necessities] Plant No 3 were credited with the successful trial production of graphite crucibles by native-style methods, contributing enormously to the steel and copper smelting industry now "blooming across the land" under the new situation.

When this new product was tested at the Pei-t'a Ch'u Metallurgical Laboratory, Soochow, it was found to possess a fire resistance of 1800°C (melting point), basically suited to the reduction of copper and iron ores.

The biscuit makers, despite their low personal cultural standards, were devoted to the study of such fire resistant materials as carborundum wheels. In 1957, the production of graphite crucibles was attempted on three successive occasions without success, mainly due to inability to mix ingredients. Profiting by experience gained through failure, a fourth attempt was made in 1958 when the great leap forward move was at its height.

The composition was modified. The grog was pressed into a flat piece, coal-fired for 20 minutes at a temperature of 500-600°C, and immediately dipped in cold water for 20 minutes after removal from the kiln. This trial production was repeated thrice, and the fired article did not crack up. In May, 1958, it formally entered production to satisfy the demand of the metallurgical industry in Soochow and other areas.

The composition of the graphite crucibles follows:

$$\left.\begin{array}{l}\left.\begin{array}{ll}\text{Su-chou clay} & \frac{40}{100} \\ \text{Nan-shan clay} & \frac{40}{100} \\ \text{Talc} & \frac{20}{100}\end{array}\right\} 100 = 70 \\ \text{Graphite} \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_} \quad 30\end{array}\right\} 100$$

SUCCESS ACHIEVED IN EXPERIMENTAL SUDDEN-TEMPERATURE-CHANGE-RESISTANT PORCELAIN TUBES

[The following is a translation of an article written by T'ang Chun-i, Li Te-ch'ao, Ch'ien Chih-ch'ao and Kao Kung-i, in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 14, 28 July 1958, page 7.]

High-speed sudden-temperature-change-resistant porcelain tubes have been successfully trial produced at the Ting-shu-chen Fire-Resistant Electrical Porcelain Works, I-hsing. This is the first manufacture of this new product in our country. In quality they surpass similar British makes.

These tubes play an important role in industrial equipment. The utility coefficient for British tubes is placed at 13 while that for domestic production reaches 14. For the operation of radio factories, these porcelain tubes are indispensable. In the past, supplies came from abroad. Hard-quality procelain tubes were substituted for imported goods but they were scrapped after each application due to low sudden-temperature-change resistance.

Known internationally as "leng-chi T'ao-kuan" [literally sudden-chilling pottery tubes], products made at I-hsing are composed of high temperature-resistant and strong acid-resistant materials. The advantages are: water absoprtion rate almost nil, high resistance to sudden change in temperature, durability, strong resistance to acid and caustic soda, and high degree of resistance to reaction, rust and cracking.

The first batch--1000 units--was declared up to standard by the users. Compared with imported goods, the price was reasonable. Plans are being made for their exportation to Czechoslovakia, the East German Republic, and other brother states. The technological level is being raised by the employees and workers of the factory in order to meet the demand for full production here and abroad.

FIRST BATCH OF MICROSCOPIC SLIDE EXPERIMENTALLY PRODUCED IN CUBA

[This a full translation of an article by Cheng Chen-hung in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 14, 28 July 1958, page 7.]

The Peiping Glass Factory has successfully trial-produced very thin glass slides of high quality for microscopic observation, hitherto imported from abroad. The slides compare favorably with equivalent German and Japanese lines, and measure up to international standards.

In the course of experimental production, all kinds of difficulties were encountered. First, there was no theoretical foundation or technological experience to fall back upon because glass slides had never been manufactured here before, nor were people acquainted with the equipment and tools necessary for their manufacture. Not hindered by these difficulties, the workers searched for knowledge until they were furnished non-concrete mouth-to-mouth information by a person who had visited Germany. He reported that slides were manufactured there from blown glass globes. With this as a clue, they engaged themselves in further research work by building a small kiln with over a hundred pieces of fire-resistant bricks. Glass balls were blown. The experiment was repeated until it was ultimately crowned with success. The preliminary experience was: The composition was heated up to 1,300°C (melting point). With 12 shih-liang [hectograms] of molten glass, a small bubble was blown orally. Then it was air-pumped until its diameter reached 2 shih-ch'ih at a thickness of 15 millimeters. It was continuously turned by hand as it was fired in a furnace at 800°C at the two extremities, and 600° in the middle, for two minutes. Then it was taken out, disconnected and placed on a flat plate to cool off. When the glass slide was ready, it was severed by a glass knife. The coal layer should be 7-8 inches (ts'un) thick, and each lump of coal should be 4-5 inches by measurement. Thus the temperature can be stabilized and violent fluctuation avoided. The workers at this operational stage are endeavoring

to raise the volume and quality of production in order to mass-produce glass slides for use by scientific and clinical units and to save foreign exchange for the State.

SPECIAL MANUFACTURE OF THERMO-FLASK GLASS BY THE PIT FURNACE METHOD ACCOMPLISHED BY MASTER JOURNEYMAN YANG HUNG-CH'ANG AT NANKING GLASS FACTORY

[The following is a translation of an article written by Ting Hua-hao, in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 14, 28 July 1958, pages 7-8.]

Blast furnaces are used for preparing molten glass for the manufacture of fire and heat-resistant glassware while pit furnaces are designed mainly for the production of low-grade glass goods. In a balst furance are placed crucibles each holding about 450 chin of ingredients. As production goes by batches, its melting capacity is limited. Moreover, the crucibles may be easily damaged. To remove from the furnace a crucible weighting over 300 chin at a temperature of 1400° calls for concentrated labor. A pit furnace made of fire-resistant bricks can melt 18 tons of material at a time in one 24-hour production period.

Comrade Yang Hung-ch'ang, who began to work at the age of 12, has had 33 working years in his favor and has never shirked responsibility in production. In a great leap forward situation the plan for the glass plant has been repeatedly revised. The daily production volume for thermo-flasks has risen from the original 2,400 to 15,000 units which the existing equipment is ill-prepared to fulfill.

As it is difficult for a blast furnace with limited production capacity to fulfill the planned goal, it was felt that three additional units should be installed at an investment of 25,000 yuan. At this juncture Yang Hung-ch'ang wondered whether the pit furnace designed for the manufacture of low-grade glassware could be used for the production of thermo-flasks. His suggestion was rejected by the technicians and trained workers as unpractical.

They held that since time immemorial thermo-flasks had been fired in blast furnaces only.

The attempt made at the Kiangsu Glass Factory in Shanghai had ended in failure because of the presence of sand and the development of streaks. It would be sheer stubbornness to try to achieve what had failed in Shanghai where favorable conditions prevailed. This conservative thinking had shaken Yang Hung-ch'ang 's confidence but he mustered up enough courage to suggest again that thermo-flasks be fired in a pit furnace. This courage to think, speak out and act resulted from his training through the Party's general line. Supported by his leader, he performed experiments in a semi-coal-gas furnace.

During the first test, many bubbles formed, causing the mass of molten galss to lose adhesion. The technicians and trained personnel were alerted to look for the cause. It was recognized that the defective production was brought about by a high moisture content in the sand, inconsistency in composition, and violent fluctuation in furnace temperature.

Measures were taken to insure that the composition be prepared according to specification and that furnace temperature be maintained at 1200°C-1220°C. The furnace grate was adjusted to keep temperature normal. Success came after two failures under the support of the leaders and the masses. The volume of production was increased three-fold while the cost of production dropped by 10-15 percent. Almost 400,000 yuan per annum would be saved for the State.

PENG-FOU GLASS FACTORY WORKERS INVENT A SILVER PLATING DRY KILN

[The following is a full translation of an article written by Chang Chun-ch'ing in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 14, 28 July 1958, page 8.]

By inventing a silver plating dry kiln to expedite the drying of silver plated thermo-flasks, Comrades Yu Tsun-yen and Tai Wen-lin of the thermo-flask workshop at the Peng-fou Glass Factory helped resolve the problems of increasing production volume and improving production techniques vital to the industry.

With the production of silver plating dry kilns, a step forward was made in our glass industry with respect to silver plating equipment. With the old-style "baking furnace" not only was drying time lengthened, but also the production capacity was limited. Off-standard goods also increased because it was difficult to control processing. Peeling of the silver plated flasks seriously affected the production rate for grade one glassware.

At a special national glass industry conference convened in 1957 by the central government, it was resolved that silver plating dry kilns promoted across the country to solve the problem of peeling and to augment the volume of production. A silver plating dry kiln was rushed to completion. While it helped solve the problem of peeling and assisted in stepping up production as compared with processing by a baking furnace, a new problem cropped up as breakage at the bottle neck rose to 0.6 percent.

Furthermore, excessive consumption of gas made it difficult for the existing gas equipment at the glass factory to cope with the increasing demand. Because of the limited capacity for drying in a kiln, it was estimated that, to meet requirements, at least eight or nine units should be installed. More building space was needed and workshops had to be expanded as more products that needed drying came off the production line.

Yu Tsun-yen thought that while a silver plating dry kiln was a technologically advanced piece of equipment to be promoted throughout the land, it was not without

defects. The old-style baking furnace, though backward in development, had definite advantages such as economy in gas consumption, mildness in temperature, absence of blasting, economy in space and a larger firing capacity (a baking furnace could accommodate some 570 bottles at each firing whereas a dry kiln had a maximum capacity for 48. The former operated at one turnover a day while the latter completed each cycle in 25 minutes).

To offset advantages against defects, an old-style baking furnace could be converted into a modern silver plating dry kiln by installing, in the furnace, drying devices essential to the construction of a dry kiln. Existing equipment could thus be utilized with minimum investment and the problem of improved quality was also solved.

After consulting Comrade Tai Wen-lin, an operative of silver plating dry equipment, Yu realized that their views were identical. They embarked at once on creative research work although they were employed as apprentices for less than two or three years. They had neither mechanical knowledge nor blueprints to work with. Their difficulties can be better imagined than described. Despite these handicaps, they were able, after many days of hard work, to produce a plan outlining the trial manufacture of a silver plating dry kiln.

They immediately contacted the factory's chief technician for technological guidance. The response they obtained from him was: "I have never come across such silver plating dry kilns in any textbook nor have I seen such equipment anywhere in the country. There is nothing wrong with our present silver plating dry equipment. That's all I know." They replied: "True, this is not to be found in any textbook. Nevertheless, we will come up with something never produced elsewhere."

Then they proceeded to salvage from the factory's scrapheap usable materials. With their wages they purchased what was not so obtainable. Inspired by their highly active, valuable and creative spirit, the authorities came to their aid by providing them with fund for purchasing materials and by assigning assistants to them. Thus encouraged, they labored day after day and night after night without rest until their efforts were rewarded after several months with the production of a silver plating dry kiln. Two silver plating dry kilns are now in production.

After inspection and actual application, the dry kiln proved far superior to the dry equipment then in use. The two units have a minimum production capacity for 8,400 units of glassware per day (each dry kiln accommodates 570 units at an hourly turnover). This is equivalent to the production capacity of the more than 10 units of dry equipment then in use. The problem of imbalance between the factory's increasing production capacity and its facilities for drying is now completely resolved. The existing dry equipment has not been scrapped but is being utilized to supplement production. There is a saving of about 5,000 yuan which would have had to be invested in new dry equipment. The entire portion of the investment fund for the extension of workshops can also be saved.

Since the dry kilns were put to work, discarded goods from exploding at the "loin" sector have been nil; the quality of grade one thermo-flasks has been raised; and consumption in coal gas has been notably reduced. Not only has this invention brought about a saving of more than 18,600 yuan in coal gas consumption, but equilibrium in the provision for gas equipment has been maintained. The factory is in a advantageous position for increased production.

DRAFT DESIGN FOR A PIGSKIN LEATHER FACTORY WITH A DAILY CAPACITY OF 50 (01 TYPE) AND 100 (02 TYPE) SKINS

[The following is a full translation of an article written by the Light Industry Science Research Institute, Leather Research Laboratory and published in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 17, 13 September 1958, pages 4-8.]

In order to develop the leather industry with speed, skill and economy, to cause it to bloom across the land, to synchronize with the rapid growth of hog-raising enterprises in rural areas, to satisfy the demand for footwear by the farming population, to liberate women in vast rural regions from the laborious handwork of making shoes, and to strengthen the labor force of the rural areas, we have specially prepared for reference and adoption by the various districts two types of draft design for a small-scale pigskin leather factory with daily production capacity of 50 and 100 skins.

According to the Jen-min Jih-pao [People's Daily] of 21 August, the Wei-hsing [Satellite] People's Commune of Sui-p'ing Hsien, Honan Province, built a small-scale pigskin leather factory with a daily capacity of 50 or 100 skins. The commune's needs for footwear were adequately satisfied in both raw material supply and finished products.

The commune is comprised of some 40,000 members. Each member consumes an average of 200 chin of pork annually, and assuming that each hog slaughtered yields 150 chin of pork, 53,000 hogs are needed annually. If one-third or two-thirds of the pigskins were split, there would be 15,000 or 30,000 pigskins per annum for processing. At four pairs of shoes to a pelt, each person would have from one pair and a half to three pairs of shoes per annum. Supply of shoes by the commune for its members would be assured.

To shorten the production cycle and to simplify operation, chrome tanning is adopted for the manufacture of soles and uppers. The equipment is designed to suit multiple adaptation in order to economize steel materials, electric power, and draft animal power. Since our knowledge of rural conditions is insufficient, and since conditions differ from area to area, the design was prepared from a

general survey. In building a plant, the design should be further revised with respect to local factors such as climate, direction of wind, moisture, geological conditions and topography.

I. Main Factors for Plant Construction

1. Raw Materials:

Calculated at 306 working days per annum, 15,000 fresh pigskins (50 skins daily) and 30,600 (100 skins daily) would be needed annually. Should the supply of butts fall below the required figures, surplus skins--more hogs are slaughtered on festival days--should be soaked in a saline solution and preserved to maintain the daily production equilibrium.

2. Industrial Chemicals:

To keep a pigskin leather factory with a daily capacity for 50 skins in operation, 30,000 kilograms of industrial chemicals, comprised of 16,500 kilograms of lime, about 3,000 kilograms of red alum, about 3,500 kilograms of sulfuric acid and about 7,000 kilograms of table salt, would be required per annum. For a pigskin leather factory with a capacity of 100 skins, the amount needed would be doubled pro rata. To insure that the supply is available when required, a definite quantity of industrial chemicals should be kept in storage.

3. Water Supply and Drainage:

A pigskin leather factory with a daily capacity of 50 skins should be provided with water and drainage facilities of a capacity for 13 tons per day. For a pigskin leather factory with a daily capacity for 100 skins, the amount needed daily would be about 32 tons.

The factory site should be located in an area where water is abundant. To facilitate draining and to prevent contamination of drinking water, agricultural crops and fish ponds, the site should be elevated, preferably at the lower reaches of a river where communication facilities are available.

4. For sanitary reasons the site should be downwind from the residential area, and the glue making section should be downdraft from the factory itself.

II. Products and Specifications

Types of products planned will be determined by local requirements for their production.

Types of Products	Unit	Pigskin Leather Factory with Daily Capacity of 50 Skins		Pigskin Leather Factory with Daily Capacity of 100 Skins	
		Daily Capacity	Annual Capacity	Daily Capacity	Annual Capacity
Chrome Tanned Pigskin Leather Uppers	m^2/skin	27/30	8,262/9,180	54/60	16,524/18,360
Chrome Tanned Pigskin Leather Soles	kg/skin	47.1/20	14,565.6/6,120	95.2/40	29,131.2/1224
Pigskin Glue and Gelatin	kg	4	1,224	8	2,448

III. Production Procedure

Only basic production procedures are given (operation rules and regulations are attached elsewhere). Production time can be revised to meet actual local conditions.

1. Chrome tanned pigskin leather uppers:

(Green-fleshed skins) degreasing------washing

(Pickled green-fleshed skins) soaking in water---> degreasing---> soaking in water-----------------------------------washing

draining off---> liming---> unhairing---> soaking in lime---> splitting---> soaking in lime---> wetting-out and scouring---> deliming---> ferment tanning---> soaking in acid---> chrome tanning---> resting---> washing in water---> bonding togehter of fibers---> washing in water---> mordenting and dyeing---> fat-liquoring --- .

(A pigskin leather factory with a daily capacity of 100 skins)

The procedure follows: Wetting out---> boarding---> drying---> unhairing---> (the remaining procedures follow those of the pigskin leather factory with a daily capacity for 50 skins).

2. Chrome tanned pigskin leather soles:

(Green-fleshed skins) Degreasing------washing

(Pickled green-fleshed skins) Soaking in water---> degreasing---> soaking in water---> washing in water--------------

wetting out---> liming---> unhairing---> soaking in lime---> splitting---> soaking in lime---> scouring and wetting out---> deliming---> soaking in acid---> chrome tanning---> resting---> washing in water---> coating with fixatives---> washing in water---> nailing out---> drying---> weighing---> grading---> warehousing.

3. Pigskin glue and gelatin--(Hide shavings) selection of hide pieces---> swelling by acid---> washing in water---> coating with fixatives---> washing in water---> boiling of glue---> filtering---> coagulating---> slicing---> drying---> packing.

IV. Principal Production Equipment and Tools

File No	Name of Equipment % and Tool	Specifications	Quantity (Daily Capacity 50 skins)	(Daily Capacity 100 skins)
1.	Soaking Tank	1.2x1.2x1.2 meters	2	4
2.	Lime Soaking Tank	1.2x1.2x1.2 meters	8	14
3.	Degreasing, Debristling and Unhairing Board and Tools	--	4	6
4.	Deliming and Chrome Tanning Rotating Drum	ϕ1.30x1.16 meters	3	--
		ϕ1.50x1.30 meters	--	4
5.	Wetting-out Wooden Press	1.0x1.0 meter	--	1
6.	Softening Rack and Tool	--	1	1
7.	Board	1.4x1.4 meters	60	60
8.	Glass Plate	1.4x1.4 meters	--	60
9.	Operation Table	1.6x1.0 meters	3	3
10.	Rotating Leather Drying Rack	--	--	1
11.	Lime Dissolving and Acid Solution Tile Storage Jar	ϕ 0.8 meter	8	10
12.	Hot Water Vessel and Oven	--	1	1
13.	Glue Boiling Vessel and Oven	--	1	1
14.	Small Tile Jar for Glue Coagulating	--	20	30
15.	Glue Drying Net	--	32	50

V. Water Supply, Drainage, Heating and Electric Illumination

1. Water Supply--Operating a pigskin leather factory with a daily capacity of 50 skins requires 13 tons of water per day; 32 tons of water per day are required to keep a pigskin leather factory with a daily capacity of 100 pigskins in operation.

Depending on local water supply conditions, water from a river, spring or well may be brought by bamboo pipes or transported by human labor to the workshop storage tank, or a well force-pumped by hand may be installed near the storage tank inside the workshop. A 1½ K-6 B model water pump equipped with a kilowatt dynamo is to be preferred for operating a pigskin leather factory with a daily capacity for 100 skins.

2. Drainage--Daily drainage capacity and daily water consumption capacity are about the same. In the building, covered open drains can be used; underground sewers built with tile tubes or bricks can be installed outside the building. Sewage sedimentation tanks may be sunk in the open ground so that sediment may be scraped off as it settles without polluting drinking water, farm crops and fish ponds. Sewage can be drained off at the lower reaches of the river or made to filter into the well. For drainage purpose, in a pigskin leather factory with a daily capacity for 100 skins, a 1½ K-6B model water pump equipped with a one kilowatt dynamo is preferred.

3. Heating--Hot water is supplied by the oven. Through its smoke stack the residual heat is funneled into a drying chamber.

4. Electric illumination--Based on local conditions, the building may be illuminated by electric power, in a combination air-battery lamp, or a methane lighting device. Motive power is provided by power transmission or draft animal power. The design for a pigskin leather factory with a daily capacity of 50 skins calls for lighting equipment of 1.32 kilowatt capacity and motive power equipment of 2.80 kilowatt capacity.

For a pigskin leather factory with a daily capacity of 100 skins, the lighting equipment capacity is fixed at 1.68 kilowatt and the motive power equipment capacity at 5.4 kilowatt. Low-tension power transmission is

preferred. When this is not available, a 20 K.V.A. transformer may be used to supply power.

VI. Personnel and Labor Productivity Rate

Item	Pigskin Leather Factory with Daily Capacity of 50 Skins	Pigskin Leather Factory with Daily Capacity of 100 Ski[illegible]
Factory Registered Personnel	14	18
Administration Staff	2	2
Production Workers	12	16
Gross Production Value Per Annum (Unit 1,000 yuan)	121	242
Labor Productivity Rate (Yuan Per Man-Year):		
Per Employee	8,635	13,444
Per Production Worker	10,075	15,125

For registered personnel, annual working days are generally estimated at 306 days. The number of days production units work depends on conditions. Clinic facilities, number of holidays, food allowances and other benefits are determined by departmental leaders according to concrete local conditions.

VII. Factory Building and Workshop Planning

1. For a pigskin leather factory with a daily capacity of 50 skins, the building is constructed with bricks and timber, 9 meters wide and 29 meters long, including the

administration office and materials storage room. Near the soaking section of the building is a wooden shed, 3.6x9 meters, used for dissloving lime and boiling glue. The workshop is arranged according to the production procedure.

2. For a pigskin leather factory with a daily capacity of 100 skins, the production workshop is built with bricks and timber, 12 meters wide and 32 meters long. The workshop is planned according to the production procedure. The administration office and the warehouses for storage of materials and finished products are made of bricks and wood, 4 meters wide and 12 meters long. Lime decomposing and glue boiling are done in a wooden shed, 4x12 meters.

3. The entire arrangement should be made according to local topographical requirements. Locally procurable materials and substitutes should be used for factory construction to lower construction costs. While old premises may be used, the arrangement of the workshop must be adequately remodeled.

VIII. Estimates of Capital Construction Investment
(Unit: yuan)

Items	Factory with Daily Capacity of 50 Pigskins	Factory with Daily Capacity of 100 Pigskins
Site and Construction Expenses (Including Drying Chamber)	5,349.6	8,483.5
Equipment Expenses	2,3400[sic]	5,816
Open and Underground Drainage System	8,250 [sic]	2,865.0
Electric Illumination	423.19	465.89
Tools	2,500	300
TOTAL	9,187.79	17,930.39

IX. Technological Economic Indices

1. Principal Raw Material Consumption Index

Principal Raw Material	Unit	Chrome Tanned Pigskin Uppers (square meter)	Chrome Tanned Pigskin Soles (1,000 kg)
Green-fleshed Pigskin	kg	5.56	2,940
Sodium Sulfide	kg	0.0667	25
Lime	kg	0.5336	202
Ammonium Sulfate	kg	0.0467	57.6
Table Salt	kg	0.311	301
Sulfuric Acid	kg	0.163	150
Red Alum	kg	0.140	126
Turkish Red Oil	kg	0.1178	-

2. Cost of Production

	Factory with a Daily Capacity of 50 Pigskins		Factory with a Daily Capacity of 100 Pigskins		Pigskin Glue
	Uppers	Soles	Uppers	Soles	
Factory Cost	7.006 yuan/m^2	3.463 yuan/kg	6.935 yuan/m^2	3.41 yuan/kg	1.078 yuan/kg
Selling Price	7.65 yuan/m^2	3.800 yuan/kg	7.65 yuan/m^2	3.80 yuan/kg	1.20 yuan/kg
Profit Ratio	9.05%	9.7%	10.3%	11.4%	11.3%
Annual Profit:	10,378 yuan		23,446 yuan		-
Investment Redemption Time:	10.7 months		9.2 months		-

3. Working Capital

	Unit	Factory with a Daily Capacity of 50 Pigskins	Factory with a Daily Capacity of 100 Pigskins
Reserve Capital	yuan	780	2,760
Production Capital	yuan	4,550	9,100
Finished Product Capital	yuan	760	2,510
Total	yuan	6,090	14,370

X. Vital Statistics in Planning

1. Pigskin As Measured by Finished Product Weight

	Chrome Tanned Pigskin Uppers	Chrome Tanned Pigskin Soles
Weight of Green-Fleshed Pigskin Per Skin (kg)	5	7
Weight of Green-Fleshed Pigskin (kg)	100	100
Weight After Wetting-out (kg)	100	100
Weight After Degreasing (kg)	56	85
Weight After Chrome Tanning(kg)	53	80
Finished Product Measurement or Weight	$18m^2$	34 (kg)

2. Statistical Aspects of Pigskin Glue

(a) The weight of lime and glue accounts for 11 percent of the weight of green-fleshed pigskin.
(b) The weight of dried glue accounts for 12.5 percent of the weight of lime and glue.

XI. Waste Material Disposal Problem

1. Hog fats from the degreasing operation may be sent to the handicraft industry cooperatives or the soap works for the manufacture of soap.

2. After washing and drying, the bristles may be sent to the handicraft industry cooperatives or the brush manufactures for making brushes.

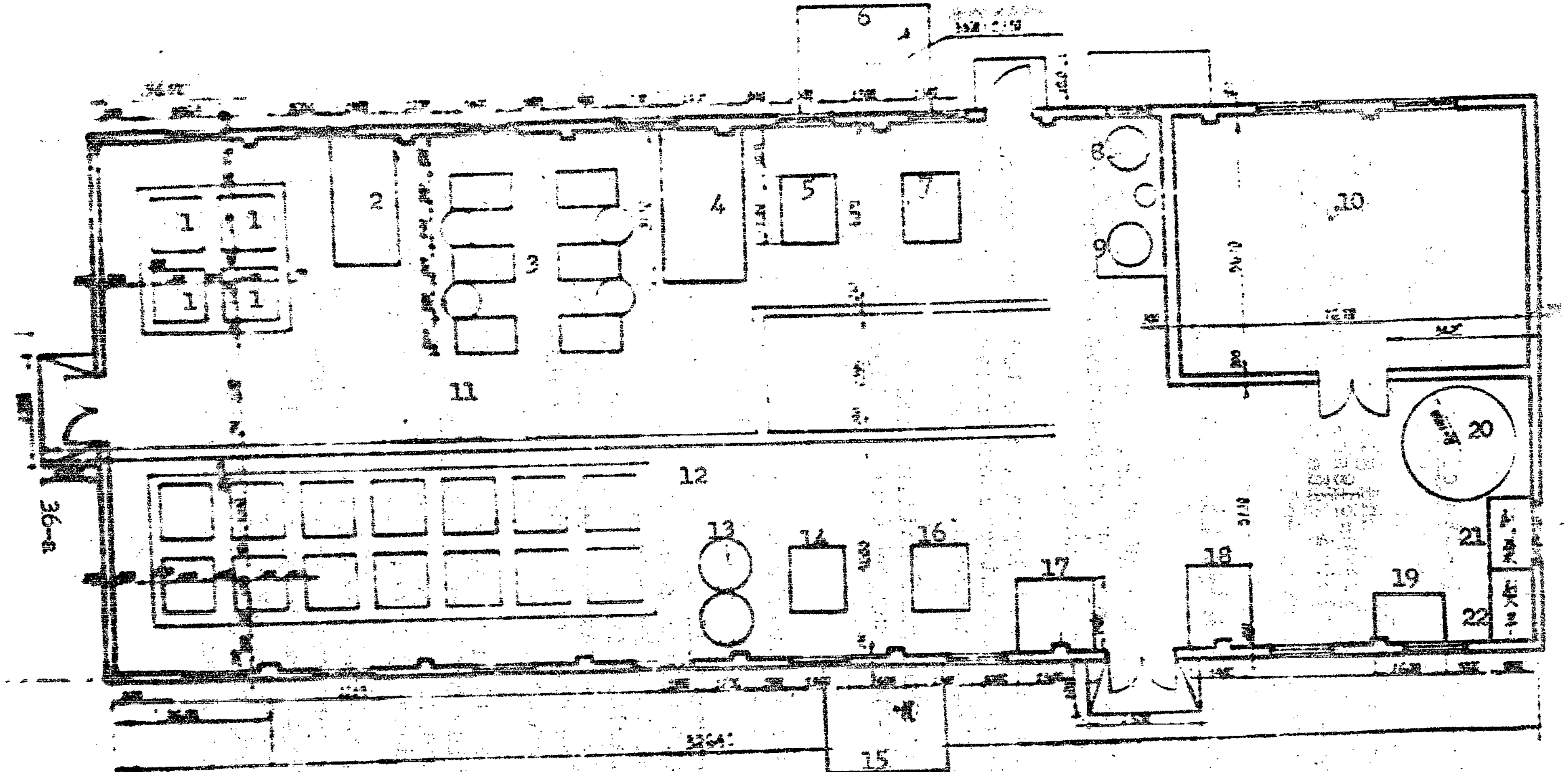
3. Residues from glue boiling and sediments in the sedimentation tanks may be used as fertilizers.

XII. Reference Materials on Leather Shoe Making

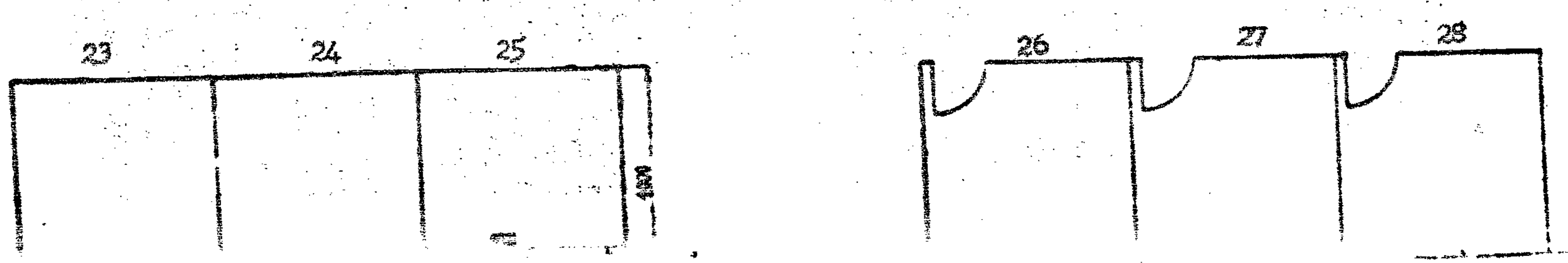
1. It requires 0.11 square meter of pigskin leather for uppers, and 0.2 kilogram of chrome tanned pigskin leather for soles, to make a pair of pigskin leather shoes. The auxiliary materials include silk and alum treated thread, cloth, nails, etc. It takes 4 man-hours to make a pair of shoes by hand. The production cost is estimated at 2.50 yuan per pair of shoes.

2. The production of pigskin leather shoes may be centered at existing buildings, each worker occupying an average floor space of 4 square meters. The work may be farmed out to be done at home.

3. Pigskin leather pieces from chrome tanned uppers and shavings from chrome tanned pigskin leather soles (the belly pigskin leather) may be sewn layer by layer into thick sole leather. Resources are thus more substantially utilized, and the cost of production is lowered.

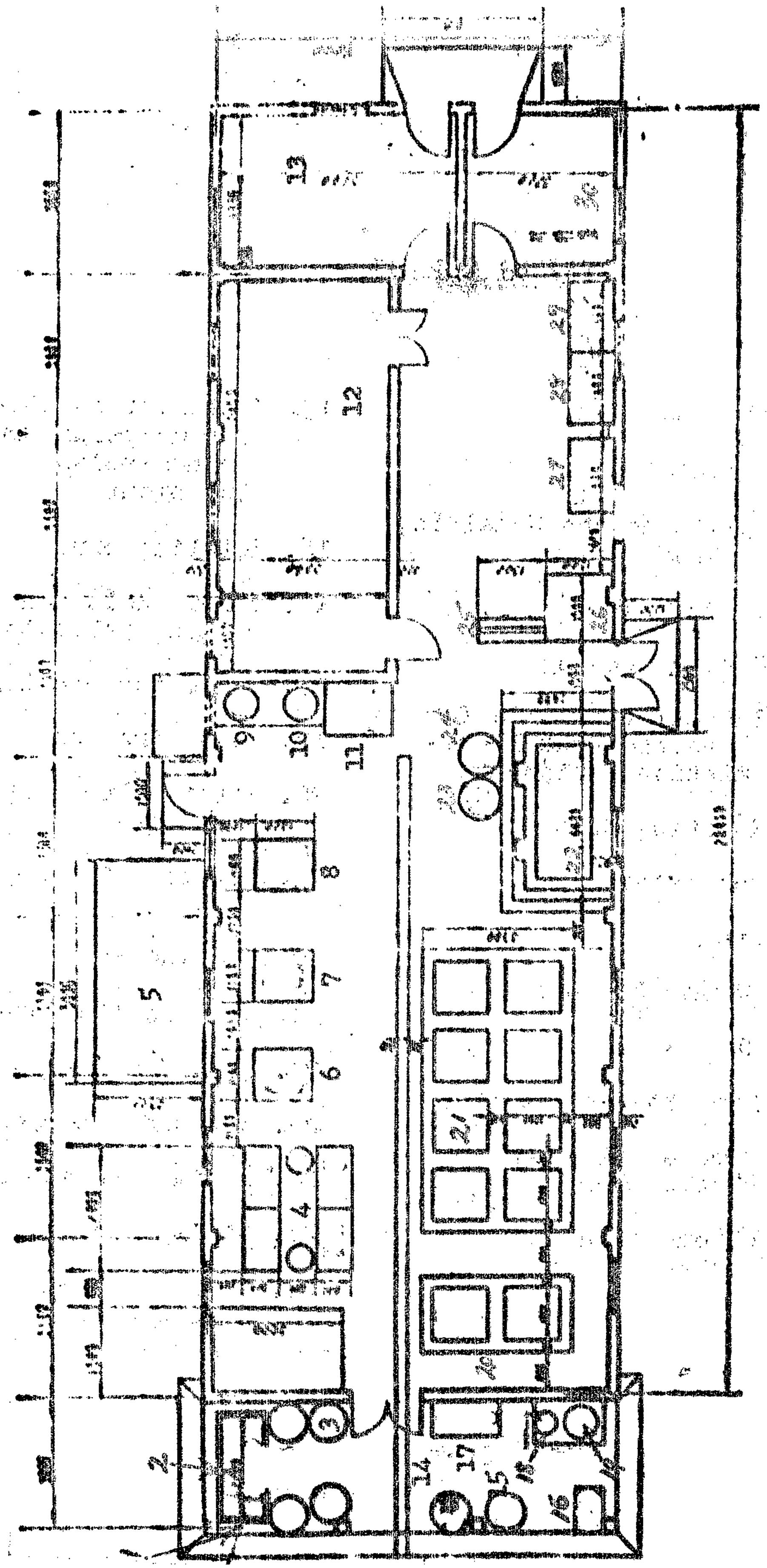


Layout Design for Workshop With A
Daily Capacity of 100 Pigskins



Key to Diagram

1. Soaking Tanks
2. Liming Tank
3. Splitting and Unhairing Boards
4. Water Tank
5. Chrome Tanning
6. Installation Site for Rotating Drum Transmission Equipment
7. Rotating Drum
8. Hot Water
9. Oven
10. Drying Chamber
11. Drains
12. Lime Soaking Tanks
13. Chrome Solution Waste Barrel
14. Chrome Tanning
15. Installation Site for Rotating Drum Transmission Equipment
16. Rotating Drum
17. Chrome Solution Mixing Laboratory
18. Softening Section
19. Measuring Room
20. Rotating Leather Drying Rack
21. Fixative Coating Room
22. Ironing Room
23. Glue Boiling Shed
24. Lime Storage Shed
25. Raw Hide Storage Shed
26. Administration Office
27. Mixing Room
28. Finished Product Storage Room



Layout Design for Workshop With Daily Capacity of 50 Pigskins

Key to Diagram

1. Low Wall Elevation
2. Lime Storage Tank
3. Lime Decomposing Tank
4. Splitting and Unhairing Boards
5. Installation Site for Rotating Drum Transmission Equipment
6. Chrome Tanning Rotating Drum
7. Chrome Tanning Rotating Drum
8. Rotating Dyeing and Washing Drum
9. Hot Water
10. Oven
11. Chrome Solution Mixing Barrel
12. Drying Chamber
13. Administration Office
14. Acid Solution Container
15. Acid Solution Container
16. Drying Net
17. Glue Slicing Board
18. Filtering Drum
19. Glue Boiling Oven
20. Soaking Tanks
21. Lime Soaking Tanks
22. Water Tank
23. Chrome Solution Waste Barrel
24. Chrome Solution Waste Barrel
25. Softening Room
26. Re-moistening Room
27. Fixative Coating Board
28. Ironing Board
29. Measuring Counter
30. Material Storage Room

DESIGN SPECIFICATIONS FOR A SMALL-SCALE PAPER MILL WITH A DAILY CAPACITY OF ONE METRIC TON

[The following is a full translation of an article written by the Paper Manufacturing Design Institute, Ministry of Light Industry, in Chung-kuo Ch'ing-kung-yeh (China's Light Industry), No 17, 13 September 1958, pages 9-13.]

I. General Explanation

To facilitate the establishment of small-scale paper mills across the country, to utilize extensively such raw materials as are available on the spot (rice-straw, wheat-straw, "lung-hsu-ts'ao" and other related fibers), to manufacture much needed cultural paper for daily use in the rural areas (such as glossed paper and paper for business and wrapping purposes), and to satisfy the people's needs for cultural livelihood, this design is specially prepared for adoption and reference by the various construction units concerned.

This design is prepared in two forms: Model I and Model II. They are identical except that there are some differences in the arrangement of equipment and the paper making production procedure.

II. Factory Construction Requirements

(1) The factory site should be close to the raw material collection center in order to reduce the cost of transportation. To operate a small-scale paper mill with a daily capacity of one metric ton would require 720 tons of processed ricestraw. Calculating on the basis that 10 percent of the total production of ricestraw can be used for paper making, the raw material base should be 2,000 hectares or more.

(2) A daily supply of 260 tons of water for factory use must be assured.

(3) Sewage must be diluted before it is flushed into the lower reaches or applied to irrigation (but it must be clearly understood that sewage be rendered harmless before application to agricultural crops.

(4) Communication factors should be taken into consideration inasmuch as charcoal and chemicals, needed for operating the factory, must be brought in from outside. The factory should be located along the river, not only to facilitate transportation, but also to economize on freight charges.

(5) The factory site should be close to the power supply, which has an important bearing on investment. For each increase of one kilometer in power lines there will be a corresponding increase of about 6,000 yuan in investment. If the outside current is not available, a steam engine may be operated to generate power, and the equipment may thus be power-driven.

(6) The factory site should be above the highest flood line.

III. Products and Production Volume

Production specifications are: 787 x 1092 millimeters and 891 x 1195 millimeters; for single-page glossed paper the standard weight is 25-60 grams per square meter. For the production of glossed paper, office stationery, posters and match wrapping paper, the daily output is placed at one metric ton or 340 metric tons per annum.

IV. Production Procedure

(1) Preparation of material--The farmers must be depended upon to remove grains, leaves and sand from the ricestalks. The heads and roots must be severed; the processed ricestalks are purchased by the mill; the roots are used as feedstuff for livestock, thus resources are rationally utilized. Processed ricestalks are machine cut into strips of 20-30 millimeters.

(2) Soaking--The strips are packed in a straw receptacle to be lifted into a soaking tank by a hand-operated crane. To this is added steamed waste fluid at 80°C. The soaking lasts for 24 hours.

(3) Steaming and boiling--The soaked straws are lifted from the tank and placed in the boiler by a hand-operated crane. A caustic soda solution is added to the boiler at a ratio of 1:10. The lid is hermetically sealed until a temperature of 102°C is attained. Each boiling period ranges from 6 to 8 hours. This completed, the straw container is lifted by a hand-operated crane and lowered into a pulp washing tank lined with horizontally woven bamboo mattings or palm-fiber blankets.

(4) Washing of coarse pulp--The coarse pulp is emptied into a pulp washing tank. This washing is repeated three or four times until the water is clear.

(5) Bleaching and kneading of pulp--The coarse pulp scraped from the tank by hand labor is thrown into baskets and then emptied into thrashers. Into each thrasher may be packed 220 kilograms of air-dried pulp. Below 4 percent concentration the pulp is dissolved, bleached, washed and thrashed. It takes 5 hour s to complete bleaching and thrashing, including time for filling and removing material. Simultaneous with thrashing, liquid fillers and glue are added. Finally, an alum solution is added to the compound. The pulp evenly compounded is poured into a mixing vat.

(6) Paper making--Model I provides for the automatic flow of pulp from the mixing vat to the digester. Here it is flushed by clear water through a circular net and diluted to 0.5-1.0 percent concentration. Then it automatically flows into a sand depositing vessel through a flat board sieve and is again diluted with clear water to a 0.2-0.3 percent concentration before it is admitted to a circular net trough. After sifting, the residue pulp is returned to the thrasher and reclaimed.

Model II - The pulp flows from a receptacle in the mixing vat into a digester. It is then pumped through a preliminary cone-shaped sand screener (two units). The screened pulp when diluted is admitted to a circular net trough while the residue pulp is deposited in a separate trough. The residue is pumped through another cone-shaped sand screen before it is drained off. The

refined pulp is now ready for paper making. By adopting this production procedure, less investment in equipment is involved. Moreover, economy in the use of copper results though more motive power is consumed.

The paper is rolled as it is dried. These reams of paper are lifted by hand-operated cranes and delivered to the cutting machines for trimming.

(7) Paper cutting, sorting and packing--The paper is cut by hand machine, sorted out, counted and packaged with such locally procurable materials as straw mattings, bamboo crates and bamboo splits. Finally, the cargo is stored in the warehouse.

Pulp making and production procedure (both designs are interchangeable) are shown in Figures 1, a and 3 [at end of translation].

V. Technical and Economic Indices

Name	Name	Index
1	Estimated Daily Working Hours:	
	Straw chopping	8 Hours
	Steaming and Boiling, Washing, Bleaching and Pulp Thrashing	24 Hours
	Paper Making	22.5 Hours
	Paper Cutting, Sorting and Packing	8 Hours
2	Losses in Material Preparation	1.5 %
3	Losses in Fibers	2.5 %
4	Cauterization Ratio	80 %
5	Caustic Lime Over-Weight Ratio	6 %
6	Total Consumption of Caustic Soda (NaOH) in Absolutely Dry Form	10 %

[Continued]

Name	Name	Index
7	Maximum Steaming and Boiling Temperature	102°C
8	Steaming and Boiling Time:	
	Soaking	24 hours
	Steaming and Boiling	8 hours
9	Rate of Obtaining Coarse Pulp (Referring to Raw Material)	55%
10	Bleaching Rate (Active Chlorine)	4%
11	Rate of Obtaining Bleached Pulp (Referring to Raw Material)	50%
12	Bleaching and Pulp Thrashing Time in Each Tank	5 Hours
13	Paper Making Mixing Rate	100% Bleached Ricestraw Pulp
14	Pulp Consumption	950 kg/ton Paper
15	Resin Consumption	10 kg/ton Paper
16	Alum Consumption	32 kg/ton Paper
17	Filler Consumption	120 kg/ton Paper
18	Pure Caustic Soda Consumption (for Dissolving Resin Glue)	12 kg/ton Paper
19	Wrapping Paper	12 kg/ton Paper
20	Anti-Moisture Paper	1.25 kg/ton Paper
21	Copper Screen	0.048 m^2/ton Paper
22	Flannel	0.47 kg/ton Paper

VI. Workshop--Arrangement and Equipment

The entire equipment, specification and quantity as applied to workshop arrangement under Model I and Model II design are shown respectively in Figure 4 and Figure 5 [both not in original text]. Equipment adopted for these two designs is essentially the same except that the Model II design is provided with one 2K-6 pulp digesting pump, one 1½K-6 residue pulp pump and three 75 millimeters diameter cone-shaped sand sieving machines with dynamo attachment. In addition a flat board screen (together with such accessories as a dynamo) and a sand depositing vessel are omitted.

The water supply equipment consists of an excavated well, which may be dispensed with where ditch or river water is available. A 2K-6a clear water pump (together with a 2.8 kilowatt dynamo) with a spread capacity of 20 m^3 per hour and a spread distance of 25 meters is also required. Daily consumption of water for the entire mill is estimated at 260m^3. It is distributed as follows: 25m^3 for steaming and boiling, 30m^3 for washing, 5m^3 for dissolving chemicals, 80m^3 for bleaching and 120 m^3 for paper making.

As to the equipment for power production, the Model I design provides for 7 dynamos with a total capacity of 35 kilowatts while the model II design is composed of 8 dynamos with a total capacity of 37.7 kilowatts. Where water power may be utilized, the establishment of a small-size hydro-electric power plant may be taken into consideration. A small-size hydro-electric power station capable of generating 44 kilowatts, with sufficient motive power for factory operation and illumination may be installed where "shui-t'ou" [literally, water head] is 2.0 meters high with a flow capacity of 5-6 m^3 per second.

A vertical-type furnace with horizontally arranged piping capable of producing 155 kilograms of steam per hour should be installed. The drying machine should be evenly steamed at 3.7 ton per day, 0.154 ton per hour (steam pressure being equal to 1.6 meter pressure). Firing a furnace will require 0.55 tons of coal per day. To operate a boiler 0.655 ton of coal per day would be needed--a total of 1.205 ton per day.

VII. Production Costs

(Estimated from Model I Design)

(1) A Ton of Bleached Ricestalk Pulp

Name	Unit	Quantity	Unit Price (Yuan)	Amount (Yuan)
Processed Rice-stalk (Moisture Content 15%)	kg	2,120	0.04	84.8
Pure Caustic Soda (95% Pure)	kg	305	0.23	70.2
Lime (75% Pure)	kg	286	0.05	14.3
Bleaching Power (Containing 33% Active Chlorine)	kg	104	0.24	25.0
Coal	kg	655	0.02	13.1
Power	kwh	265	0.08	21.2
Water	m^3	135	0.05	67.5
Wages	Work day	18	1.00	18.0
Extra Wages	-	-	-	0.72
Workshop Expenses	-	-	-	10.3
Enterprise Administrative Expenses		-	-	14.2
Total	-	-	-	278.57

(2) A Ton of Glossy (Glazed) Paper

Name	Unit	Quantity	Unit Price (yuan)	Amount (yuan)
Bleached Rice-stalk Pulp	ton	0.95	278.57	264.67
Exterior Screen	m^2	0.031	37.36	1.16
Interior Screen	m^2	0.017	24.63	0.42
Flannel	kg	0.47	30.0	14.1
Filler	kg	120	0.09	10.8
Resin	kg	10	0.588	5.88
Pure Caustic Soda	kg	1.2	0.23	0.276
Alum	kg	32	0.29	9.26
Wrapping Paper	kg	12	0.78	9.36
Moisture Resistant Paper	kg	1.25	1.23	1.54
Packing Material	--	---	--	19.0
Coal	kg	550	0.02	11.0
Power	kwh	275	0.08	22.0
Water	m^3	125	0.05	6.25
Wages	Work days	20	1.0	20.0
Extra Wages	-	-	-	1.0
Workshop Expenses	-	-	-	15.4
Factory Expenses	-	-	-	21.2
Factory Cost	-	-	-	433.32

VIII. Factory Personnel

Title	Shifts Per Work Day	Persons Per Shift	Total Number
Director	1	1	1
Chief Technician	1	1	1
Treasurer (General Affairs Concurrently)	1	1	1
Salesman	1	1	1
Ricestalk Chopper	1	2	2
Bleacher	3	2	6
Boiler	3	2	6
Washer	3	1	3
Chemicals	3	1	3
Paper Maker	3	2	6
Cutter and Packer	1	3	3
Sorter	1	2	2
Power and Water Supply Attendant	3	2	6
Repairer	1	1	1
Total	-	-	43

IX. Consumption of Raw Materials

(Estimated from Bleached Ricestalk Pulp and Glossy Paper)

No	Name	Consumption Per Day	Consumption Per Annum
1	Processed Ricestalk (Containing 15% Moisture)	2120 kg	720 ton
2	Straw Strips (15% Moisture)	2090 kg	710 ton
3	Pure Caustic Soda (95% Pure)	305 kg	103 ton
4	Lime (75% Pure)	280 kg	97 ton
5	Bleaching Powder (Containing 33% Active Chlorine)	104 kg	35.4 ton
6	Resin	10 kg	3.4 ton
7	Alum	32 kg	10.9 ton
8	Filler	120 kg	40.8 ton
9	Wrapping Paper	12 kg	4.08 ton
10	Mositure-Resistant Paper	1.25 kg	0.425 ton
11	Copper Screen	0.048 m^2	16.3 m^2
12	Flannel	0.47 kg	160 kg
13	Coal	1.205 ton	410 ton
14	Power	540 kwh	184,000 kwh
15	Water	260 m^3	88,400 m^3

X. Investment Estimate

Number	Name of Equipment	Quantity	Amount (yuan)
	(1) Minimum Estimate on Technical Equipment Investment		35,570
1	Boiler	2 units	1,400
2	Washing Tanks Soaking Tanks	2 6	- 500
3	Thrasher	1 unit	7,000
4	Mixer	1	3,000
5	Sand Depositing Vessel	1	200
6	Flat Board Screen	1 unit	4,000
7	Paper Making Machine	1 unit	12,000
8	Cutting Machine	1 unit	300
9	Packing Machine	1 unit	200
10	Chopping Machine	1 unit	300
11	One-ton Hand-Operated Crane	2	500
12	"K'o-hua" Trough	2	1,000
13	Caustic Soda Solution Storage Trough	2	400
14	Two-inch Hand-Operated Caustic Soda Solution Pump	2	600
15	Clear Water Pump	1 unit	500
16	Bleaching Powder Dissolving Barrel	1	1,500
17	Bleaching Powder Solution Storage Tank	2	300

[Continued]

Table Cont'd

Number	Name of Equipment	Quantity	Amount (yuan)
18	Bleaching Powder Solution Hand-Operated Pump	1	250
19	Filler Container	1	35
20	Alum Drum	1	35
21	Resin Barrel	3	30
22	Glue Container	1	35
23	Caustic Soda Solution Drum	1	35
24	Hand-Cart	2	700
25	Scales and Sorting Table	-	350
26	Straw Silos	8	3,200
	(2) Minimum Investment on Water Supply, Power and Gas Equipment		
1	Clear Water Pump	1 unit	450
2	Native-Style Well	1	500
3	Boiler	1 unit	3,000
4	Transformer	1 unit	2,000
	(3) Minimum Investment on Construction		
1	Principal Factory Building	328 m^2	10,000
2	Auxiliary Construction, etc.	-	1,200
	(4) Investment on Surface and Underground Sewers and Piping		4,000
	(5) Other Investment Expenditure		3,000
GRAND TOTAL			62,520

The increase in investment on the Model II equipment is brought about by the addition of a digester (560 yuan), a residue pulp pump (320 yuan), three cone-shaped sand screeners (600 yuan) and additional piping. Moreover, by dispensing with a flat board sieve (together with dynamo attachment) and a sand depositing vessel, a reduction is made. Further reductions on equipment investment may amount to 2,520 yuan.

Note: The investment figures given above do not include the factory site purchase price and miscellaneous expenses for personnel training.

XI. An Estimate of Working Capital

(1) Reserve Fund Specification (the amount fluctuates with the unit price of the raw materials held in storage)

Raw Material	Storage Time (Day)	Storage Quantity	Unit Price (yuan)	Amount (yuan)
Ricestalk	100	212 ton	40	8,500
Pure Caustic Soda	25	7.62 ton	230	1,750
Lime	10	2.85 ton	50	142
Bleaching Powder	25	2.6 ton	240	625
Resin	25	0.25 ton	588	147
Alum	25	0.8 ton	290	232
Filler	25	3 ton	90	270
Wrapping Paper	25	0.3 ton	780	234
Moisture Resistant Paper	25	0.03 ton	1230	37
Copper Screen:				
40-mesh, $352m^2$		3 sheets	24.63	261
70-mesh, $352m^2$		6 sheets	37.36	790

[Cont'd]

Table Cont'd	Storage Time (Day)	Storage Quantity	Unit Price (yuan)	Amt (yuan)
Flannel 470 grams per m^2, 1x15 m	-	6 sheets	30	210
Coal	15	18.1 ton	20	362
Others	-	-	-	4,440
Minimum Estimate	-	-	-	18,000

(2) Production Fund Specification--to be estimated at 3-day intervals as specified, equal to 433.3 per day x 3 = 1,300 yuan.

(3) Finished Product Fund Specification--to be estimated at 10-day intervals as specified, equal to 433.3 per day x 10 = 4,333 yuan.

Total Working Capital: 18,000 + 1,300 + 4,333 = 23,633

XII. Total Economic Indices

(1) Annual Merchandise production value--340 x 800 (unit product price) = 272,000 yuan.

(2) Production cost per ton: 433.3 yuan.

(3) Total annual production cost: 340 x 78 yuan = 147,288 yuan.

(4) Total annual enterprise profit: 272,000 - 147,288 - 340 x 78 yuan = 98,192 yuan.

(5) Investment fund on annual production volume per ton: 62,520 ÷ 340 = 185 yuan.

(6) Time fixed for capital construction investment recovery: 62,520 ÷ 98,192 = 0.64 year = 8 months.

XIII. How To Adapt Local Production Conditions to This Design

(1) By this design the workshop is set up lengthwise, the building itself measuring 48 meters long. If an existing temple or building were converted into a mill, the workshop would be broken up into three compartments: a sector for chopping, soaking, boiling and washing; a sector for bleaching, pulp thrashing and paper making; and a sector for cutting, sorting, packing and warehousing. In breaking up the workshop into compartments, the following should be noted:

(a) The thrasher should be placed as close as possible to the digester to facilitate the transfer of pulp;

(b) the furnace should be set up in close proximity to the paper making machine and the drying equipment.

(2) While a simple structure available on the spot may serve as a factory building, the sector from the soaking tank through the thrasher to the upper section of the paper making machine, where a one-ton hand-operated crane is to be installed, must be housed in a structure capable of withstanding a load of one ton. The building must be well ventilated and sheltered from wind and rain. The four walls need not be constructed entirely of bricks. Earth walls or bamboo fences may be erected half-way above the brickwork.

(3) In breaking up the workshop into three sections, the height of the building for pulp thrashing and paper making should conform to indications in Figures 4 and 5 [not in original text] although the boiling section may be lowered by 500 millimeters.

(4) Under favorable local geological conditions where underground water level is rather low the mixer may be installed below the ground level, above which is placed the pulp thrashing machine. From the mixer the pulp flows into the digester where it is diluted by clear water flushing. Then it is pumped through a sand depositing screen. Thus the additional expenditure on earthwork excavation and the installation of another water pump (about 500 yuan) is compensated for by a reduction in the height of the factory building, which means a saving in construction investment.

(5) Local resources should be made use of as much as possible. The soaking tank, pulp washing tank and digester may be built with bricks; wooden drums and troughs or pottery containers may be used instead; and the thrasher may be built with bricks or wood blocks, which means a saving in iron, steel and cement.

(6) The walls of an open boiler may be built with bricks; wooden barrels may also be used as boilers.

(7) The estimate on investment is calculated from current prices in Peiping. Actually, if locally available materials and existing buildings were utilized in accordance with simple rural traditions, some 30,000 yuan instead of 62,000 yuan would be sufficient for constructing a small-scale paper mill.

[Diagrams follow.]

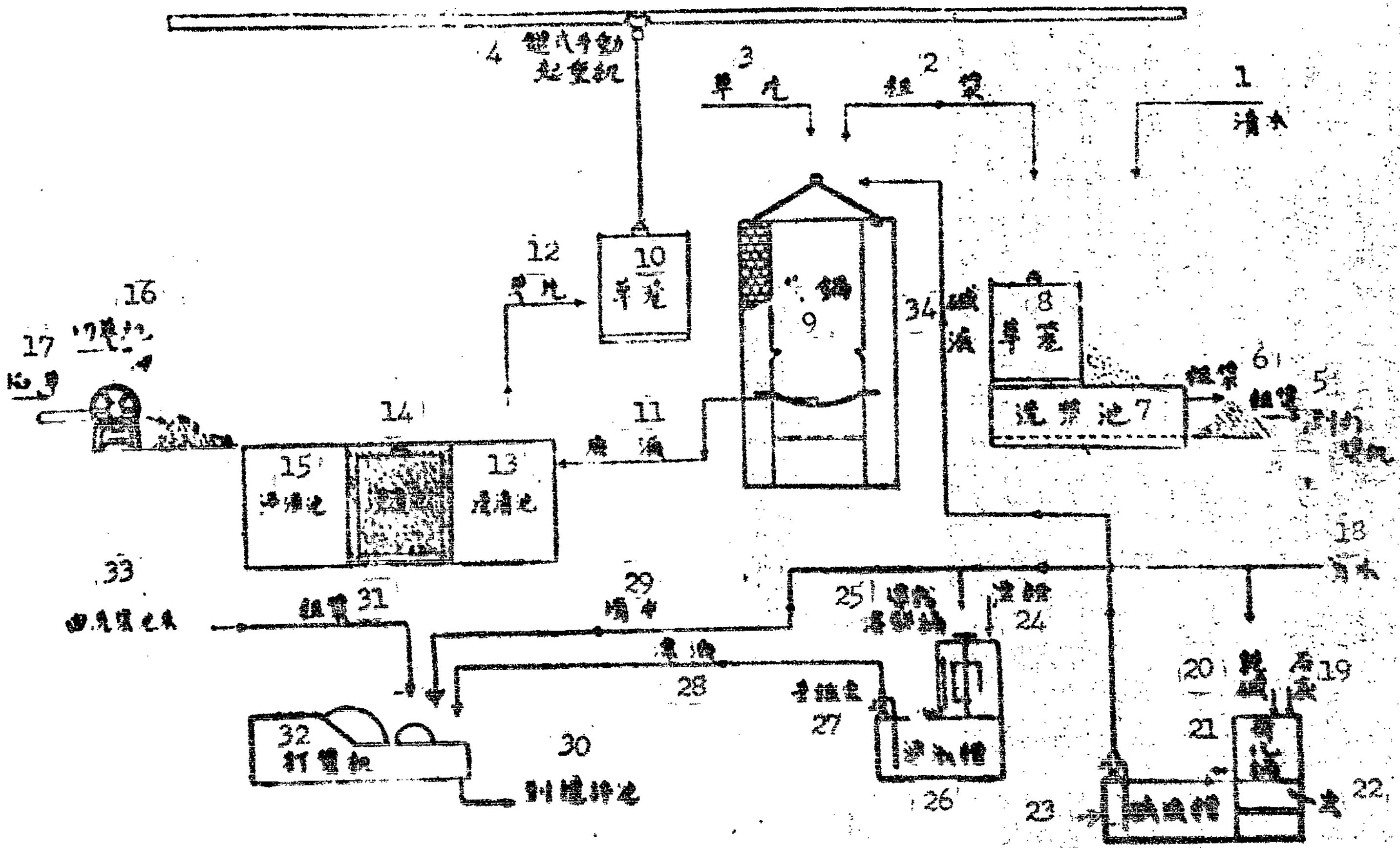
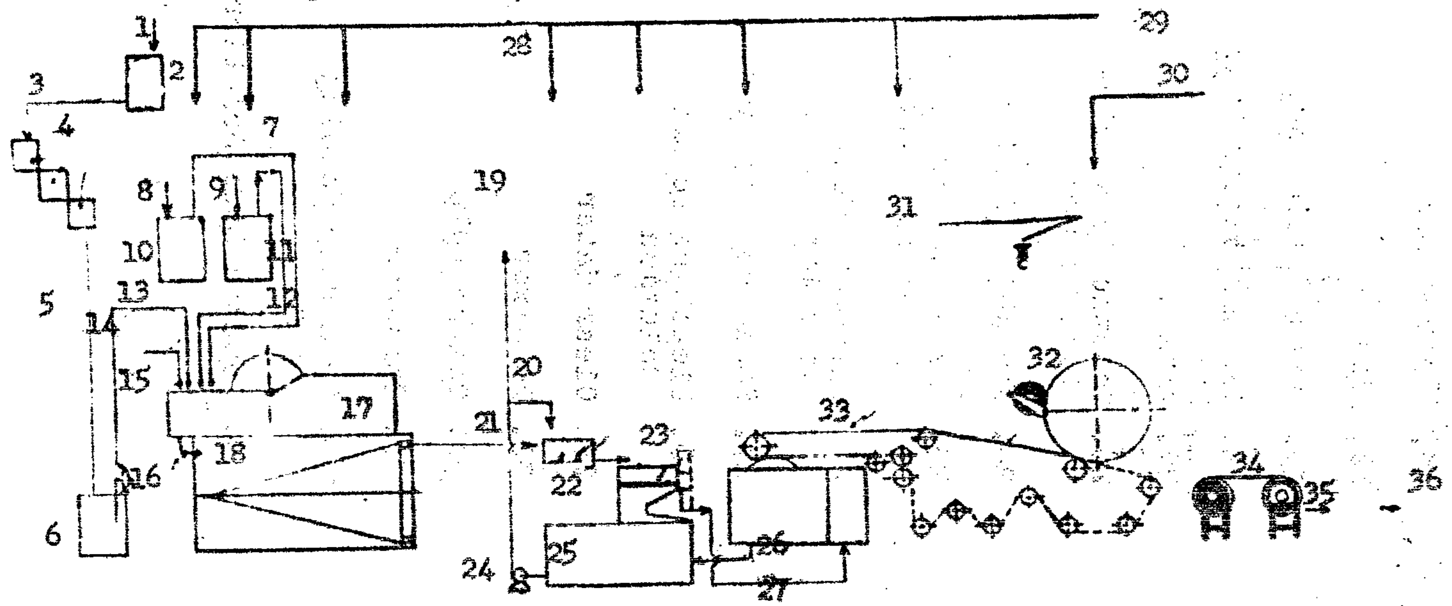


Figure 1. Pulp Production Procedure

Key to Figure 1

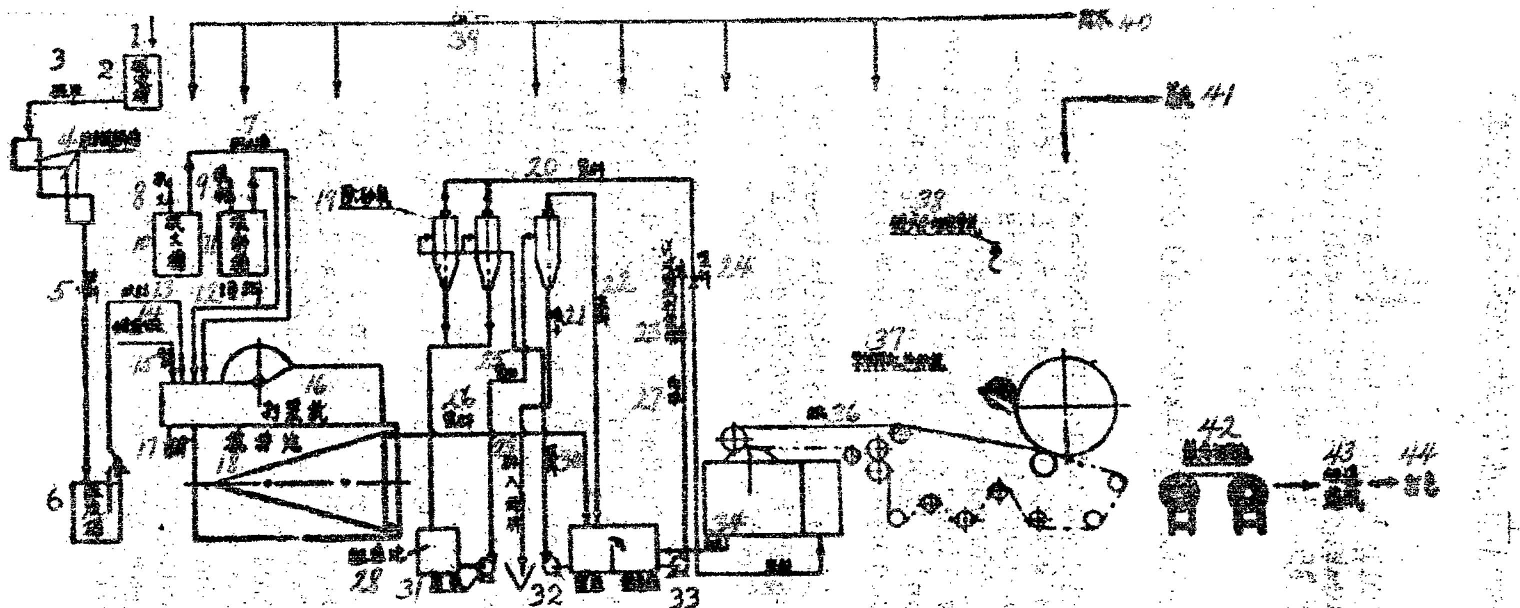
1. Clear Water
2. Coarse Pulp
3. Ricestalk Strips
4. Hand-Operated Crane
5. Coarse Pulp Flowing into Thrasher
6. Coarse Pulp
7. Pulp Washing Tank
8. Straw Receptacle
9. Boiler
10. Straw Receptacle
11. Residual Solution
12. Ricestalk Strips
13. Soaking Tank
14. Soaking Tank
15. Soaking Tank
16. Chopping Machine
17. Ricestalk
18. Clear Water
19. Lime
20. Pure Caustic Soda
21. Causterization Drum
22. Firing
23. Caustic Soda Solution Trough
24. Bleaching Powder
25. Bleaching Powder Dissolving Barrel
26. Bleaching Powder Solution Trough
27. Hand-Operated Pump
28. Bleaching Powder Solution
29. Clear Water
30. To Mixer
31. Coarse Pulp
32. Thrasher
33. From Pulp Washing Tank
34. Caustic Soda Solution

Figure 2. Paper Production Procedure (Model I Design)



1. Caustic Soda Solution
2. Caustic Soda Solution Trough
3. Caustic Soda Solution
4. Acid Dissolving Trough
5. Acid
6. Acid Solution Drum
7. Alum Solution
8. Alum
9. Filler
10. Alum Drum
11. Filler Drum
12. Filler
13. From Washing Tank
14. Acid
15. Coarse Pulp
16. Pulp
17. Pulp Thrasher
18. Mixer
19. For Washing/Thrashing
20. Clear Water
21. Pulp
22. Sand Depositing Vessel
23. Flat Board Sieve
24. Clear Water Pump
25. Clear Water Tank
26. Clear Water
27. Pulp
28. Clear Water
29. Clear Water
30. Steam
31. Chain-Type Hand-Operated Crane
32. Single-Net One-Cylinder Paper-Making Machine
33. Paper
34. Drum-Type Cutter
35. Trimming and Sorting
36. Packing

Figure 3. Paper Production Procedure (Model II Design)



1. Caustic Soda Solution
2. Caustic Soda Solution Trough
3. Caustic Soda Solution
4. Acid Dissolving Trough
5. Acid
6. Acid Solution Drum
7. Alum Solution
8. Alum
9. Filler
10. Alum Drum
11. Filler Drum
12. Filler
13. From Washing Tank
14. Acid
15. Coarse Pulp
16. Thrasher
17. Pulp
18. Mixer
19. Sand Screen
20. Pulp
21. Residue
22. Pulp
23. For Washing/Thrashing
24. Pulp
25. Pulp
26. Pulp
27. Clear Water
28. Coarse Residue Tank
29. Flushed into Underground Sink
30. Pulp
31. Pulp Pump
32. Pulp Pump
33. Clear Water Pump
34. Clear Water
35. Pulp
36. Paper
37. Single-Net One-Cylinder Paper-Making Machine
38. Chain-Type Hand-Operated Crane
39. Clear Water
40. Clear Water
41. Steam
42. Drum-Type Paper Cutter
43. Trimming and Sorting
44. Packing

The Ceramics Industry Enters A New Historical Period

[The following is a full translation of an article written by the staff of Chung-kuo Ch'ing-kung-yeh (China's Light Industry), Peiping, No 15, 13 August 1958, pages 3-7.]

Ting-shu-chen, I-hsing--Its Brilliant Achievement

Ting-shu-chen, I-hsing, in Kiangsu Province, is a renowned pottery production district. Since the Liberation, the development of the ceramics industry has entered a new historical period. Through its success in the trial production of many new lines, a broad path is blazed for the service of the nation's industrial and agricultural construction. In this connection, a few types are here introduced hereunder:

Ceramic piping--This item is principally used in water conservancy engineering and subterranean drainage layouts, its diameter ranging from a few inches to a few feet (Figure 1).

The Ch'i-li-t'ing reservoir at Chang-chu was constructed with ceramic piping as a substitute for iron, steel and cement, thereby saving 3 tons of iron and steel, and 5 tons of cement. In many respects, ceramic piping is superior to steel piping which is likely to disintegrate into rust when it is buried underground for a long time. Ceramic piping is made to endure for more than a thousand years. What is more important, ceramic piping is economically preferable to iron and steel because it is more than 50 percent less expensive.

Farms in some areas have already been irrigated by a network of ceramic piping. The advantages lie in the fact that fewer or no drains need be laid. Thus, a larger area can be put under cultivation, which is reflected in increased yield in agricultural production.

Ceramic piping is higher in impact strength than tile piping and far more durable. The demand for this product from various quarters was not satisfied although the works at I-hsing produced 400,000 units during the first half of 1958.

Ceramic pumps for farm irrigation--A 14-inch low-compression water pump was successfully produced in a recent trial, thus saving 300 kilograms of iron and steel. While ceramic pumps are inferior to iron pumps in impact strength, they possess characteristics superior in their own right: they are rust resistant, not prone to erosion, light and easily portable; durable if carefully protected, economical by more than 50 percent and highly adaptable to rural requirements.

At a trial operation, ceramic pumps were capable of 1,000 revolutions per minute, discharging 400 tons of water per hour at a pumping range of 5 meters. Considering the fact that over 300 mou of land can be irrigated in 24 hours, they compare quite favorably to iron pumps in efficiency.

Other articles such as seed dipping tanks, feeding plates, fertilizer vats, silkworm basins, seedling vessels, etc., will all be put into mass production to satisfy agricultural production needs and to meet requirements for the development of subsidiary farm production.

Not only does Ting-shu-chen, I-hsing, produce a large quantity of ceramic products to assist in farm production but it also excels in the mass production of acid resistant ceramics vessels for industrial applications.

Classified according to their difference in use, acid resistant industrial appliances are mainly as follows: Acid resistant piping and accessories include ceramic pipes and accessories of plain-head, shrunk-link and French type including elbows, T-joints, cross-shape pipes, etc., (Figure 2).

Taps--Water vessel and water lock taps--different in design and specification are in wide use and are capable of meeting the needs for different applications. (Figure 14).

Lining materials--Acid resistant bricks and acid resistant ash such as various types of standard or difficultly shaped acid resistant bricks, acid and heat resistant bricks, acid resistant ash, etc, are used for the construction of acid storage tanks, troughs, acid resistant flooring, ammonium sulphate sodium chloride paper pulp boilers, and boilers for the extraction of bran from cottonseed linters and peanut shells by hydrolysis.

Ceramic machine equipment--centrifugal pumps (Figure 15), turbine pumps (Figure 16), and "na"-type gas pumps (Figure 17), etc. Where the interior of the apparatus comes in contact with the acid, the instrument must, of

necessity, be built with chemical ceramics to be able to resist reaction from strong acids other than hydrofluoric acid. Other appliances include all kinds and specifications of vertical type blast machines (Figure 18) and horizontal type blast machines (Figure 19). The parts that come in touch with erosive gases must be protected by chemical ceramics, the machine being enclosed in an iron covering.

The machine shown in Figure 20 is known as "lan-pan-chi." When it is set in motion the acid is thrown out in a predetermined direction by means of a revolving ceramic impeller. This causes the flying acid to fall evenly upon the copper and zinc plate which is eaten into by the acid. The plate is turned into elevations and depressions. This equipment is indispensable in lithographic printing.

A small-size sulfuric acid works, capable of producing 250 kilograms per day, has been recently designed by the Ministry of Chemical Industry. It is planned that the entire equipment will be manufactured with acid resistant ceramics. It is estimated that 9 absorption towers--each 10 meters in height--need be erected for the plan to be completed. In addition, there will be all kinds of acid resistant piping and conveying equipment.

Judging by the various kinds of products successfully trial-produced at Ting-shu-chen, I-hsing, it will not be too long before a sulfuric acid works, entirely constructed with ceramics, will make its appearance.

Again, it is almost impossible to enumerate item by item such ceramic products as are of service to industrial production and construction. For example, water mains so essential in city construction and piping for the discharge of cinders by hydraulic power, so important to the operation of power plants, which in the past were made of iron and steel, are being replaced by ceramics.

A water pressure test conducted by the Shanghai Bureau of Capital Construction and the Shanghai Electric Power Design Institute (Tien-li She-chi Yuan) showed that piping with a diameter of 200 millimeters, a length of 660 millimeters, and a thickness of 25 millimeters could withstand a pressure of 13 kilograms per square centimeter (that is, 13 industrial air pressure). Results were satisfactory.

Generally speaking, ceramic piping with a thickness under the 14-24 millimeter range can withstand water pressure of 9-12 kilograms per square centimeter (that is,

9-12 industrial air pressure) to the perfect satisfaction of the technological demand of working units.

Ceramic piping is priced at 6.45 yuan per meter (200 x 660 x 25 millimeters), which is equivalent to 47 percent of the price of iron piping of corresponding specification.

Again, ceramics has replaced iron, steel and copper in the manufacture of silk reeling machine operating platforms because of its resistance to rust and erosion and its superiority over metals. The price is reasonable too. By using ceramics, the quality of the product is also raised.

Because of its high insulating property, ceramics has been employed for the production of electric bulb sockets, thus cutting down the importation of galvanized sheets. Now the Shanghai Bulb Manufacturing Factory has entered into production on a large scale.

As introduced in Chung-kuo Ch'ing-kung-yeh, No 13, glass fiber crucibles have emerged from the production line as substitutes for platinum crucibles, supporting in no small way the growth of the glass fiber industry. It was mentioned in No 14 of this publication that gas furnace, graphite crucibles and sudden-temperature change-resistant porcelain tubes are at present urgently needed.

During recent years I-hsing has contributed splendidly to the manufacture of industrial and agricultural machinery and equipment by using ceramics as a substitute for iron, steel and other precious metals. This achievement will expand and find new applications as the technological development of the ceramics industry is stepped up in line with the rapid expansion of the nation's industrial and agricultural production enterprise. The role that the ceramics industry will play in our national economy will outdo what has already been done.

On the strength of existing technological attainments, it is entirely possible to utilize ceramics for the manufacture of paper making machinery, distillery equipment and oil extraction machinery. By virtue of its high resistance to pressure, ceramics may perhaps be used for the manufacture of bases for lathes and other kinds of mechanical equipment as long as there is neither too great stress or pressure. It is possible for ceramics to replace metals.

It is evident that the ceramics industry has already functioned and will loom large as a reserve force for the machine industry and the iron and steel industry. (Compiled by editors of Chung-kuo Ch'ing-kung-yeh).

Figure 1

Figure 2

Figure 3

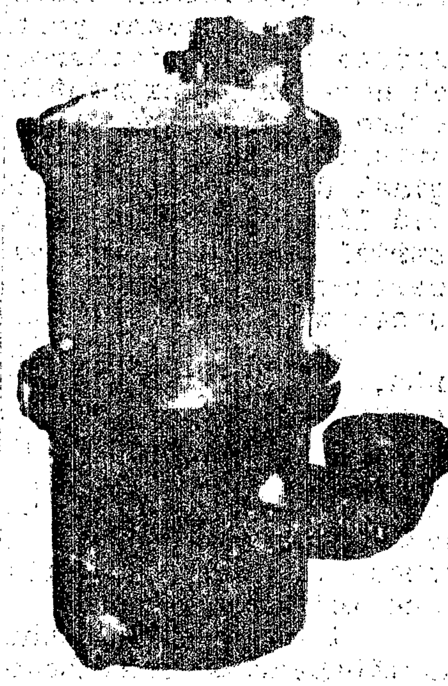
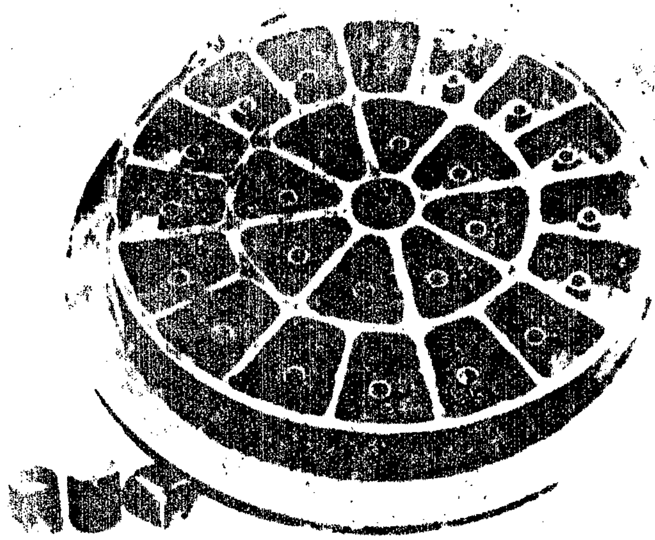


Figure 4



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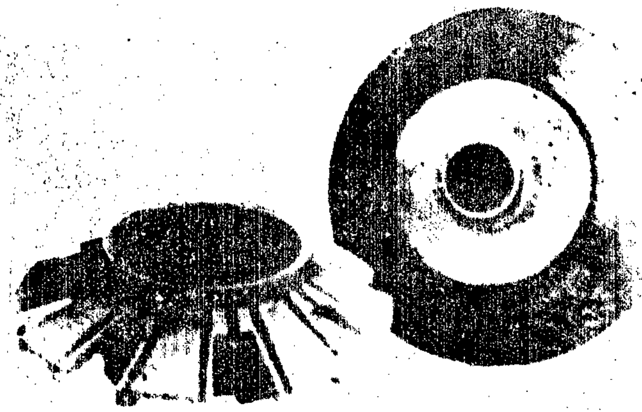

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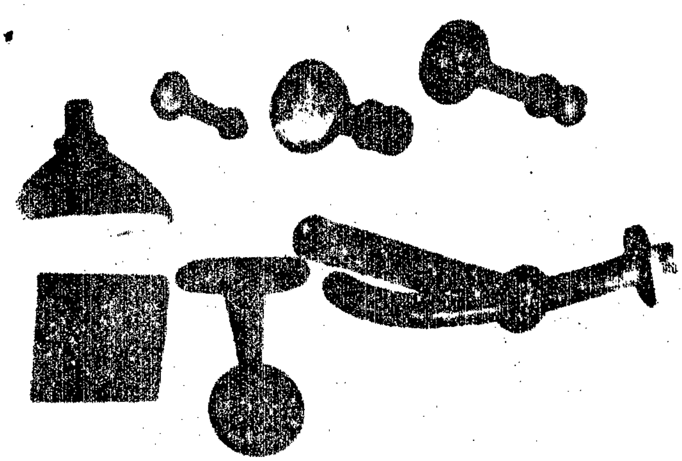

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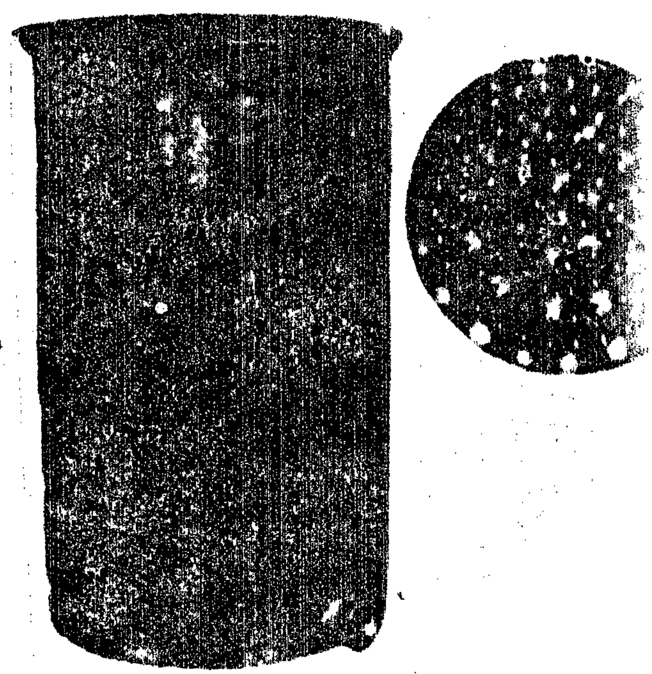

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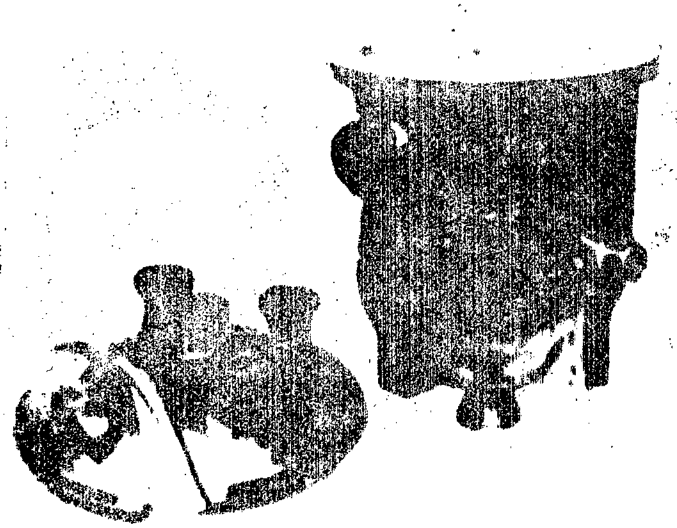

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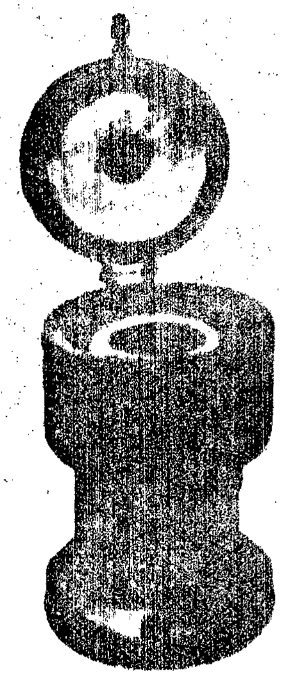

Figure 10

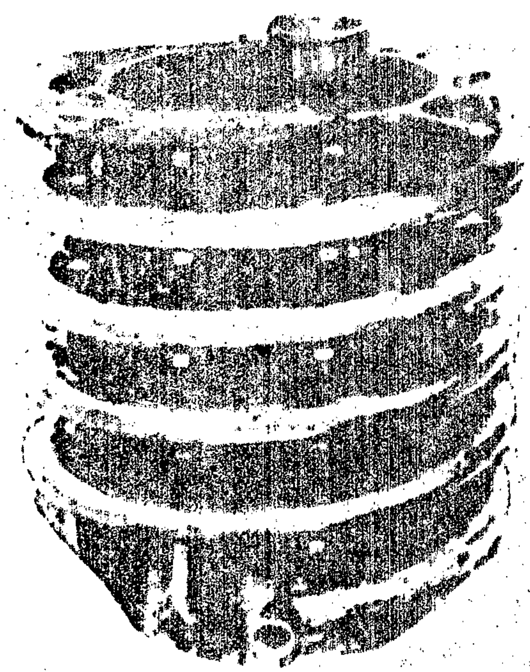

Figure 11

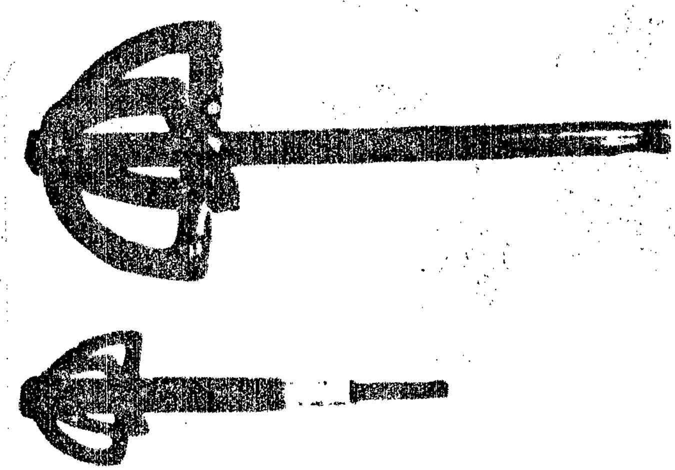

Figure 12